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BERGER ASSOCIATES INC HARRISBURG PA

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NATIONAL DAM INSPECTION PROGRAM, SHEPPARD DAM (NDI NUMBER PA-00--ETC(U)
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SUSQUEHANNA RIVER BASIN

(6) SHEPPARD DAM *(1)*

National Dam Inspection Program.

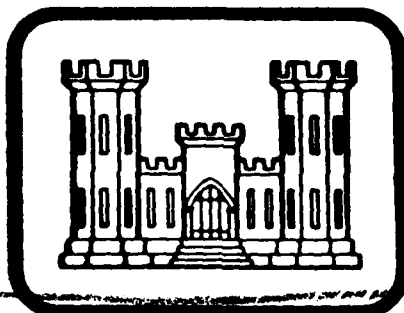
~~FEDERAL~~ SHEPPARD Dam

(NDI ~~NO~~ ^{Number} PA-00333,

DER ~~NO~~ ^{Number} 1-71), Susquehanna River Basin,

ADAMS COUNTY, PENNSYLVANIA.

PHASE I INSPECTION REPORT,
NATIONAL DAM INSPECTION PROGRAM



(35) *DAEW 31-81-C-2013*
PREPARED FOR

DEPARTMENT OF THE ARMY

Baltimore District, Corps of Engineers

Baltimore, Maryland 21203

(10) *Hendryk / Jones*

BY

Berger Associates

Harrisburg, Pennsylvania 17105

(11) FEBRUARY 1981

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PREFACE

This report has been prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITIONS
AND RECOMMENDATIONS

Name of Dam: SHEPPARD DAM
State & State No.: PENNSYLVANIA, 1-071
County: ADAMS
Stream: TRIBUTARY OF SOUTH BRANCH CONEWAGO CREEK
Date of Inspection: October 9, 1980

Based on the visual inspection, past performance and the available engineering data, the dam and its appurtenant structures appear to be in good condition.

In accordance with the Corps of Engineers' evaluation guidelines, the size classification of this dam is small and the hazard classification is significant. These classifications indicate that the Spillway Design Flood (SDF) should be in the range of the 100 year flood to one-half the Probable Maximum Flood (PMF). The recommended SDF for this structure is the 100 year flood. The spillway capacity is adequate for passing the SDF peak inflow without overtopping the dam. The spillway, therefore, is considered to be adequate.

^{Some}
The following recommendations ~~are~~ presented for immediate action by the owner, ^{and}:

1. That the tree trunk in the forebay area be removed,
2. That the sliding gate in the intake tower be maintained and operated on a regular basis to ensure its functioning in time of an emergency,
3. That the weed growth on the upstream slope and in the spillway outlet channel be removed on at least an annual basis,
4. That a formal surveillance and downstream warning system be developed for use during periods of high or prolonged rainfall.

SHEPPARD DAM NDI-ID NO. PA-00333 DER-ID NO. 1-071
PETER H. SHEPPARD ADAMS COUNTY

5. That an operation and maintenance manual be prepared for guidance in the operation of the dam during normal and emergency conditions, and that a schedule be developed for the annual inspection of the dam and its appurtenant structures.

SUBMITTED BY:

BERGER ASSOCIATES, INC.
HARRISBURG, PENNSYLVANIA

DATE: February 2, 1981



H. Jongsma

APPROVED BY:

James W. Peck
JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

DATE: 4 March 81

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OVERVIEW
SHEPPARD DAM
Photograph No. 1

TABLE OF CONTENTS

	<u>Page</u>
SECTION 1 - <u>PROJECT INFORMATION</u>	
1.1 GENERAL	1
1.2 DESCRIPTION OF PROJECT	1
1.3 PERTINENT DATA	2
SECTION 2 - <u>ENGINEERING DATA</u>	
2.1 DESIGN	5
2.2 CONSTRUCTION	5
2.3 OPERATION	5
2.4 EVALUATION	5
SECTION 3 - <u>VISUAL INSPECTION</u>	
3.1 FINDINGS	7
3.2 EVALUATION	8
SECTION 4 - <u>OPERATIONAL PROCEDURES</u>	
4.1 PROCEDURES	9
4.2 MAINTENANCE OF DAM	9
4.3 MAINTENANCE OF OPERATING FACILITIES	9
4.4 WARNING SYSTEM	9
4.5 EVALUATION	9
SECTION 5 - <u>HYDROLOGY/HYDRAULICS</u>	
5.1 EVALUATION OF FEATURES	10
SECTION 6 - <u>STRUCTURAL STABILITY</u>	
6.1 EVALUATION OF STRUCTURAL STABILITY	12
SECTION 7 - <u>ASSESSMENT AND RECOMMENDATIONS</u>	
7.1 DAM ASSESSMENT	14
7.2 RECOMMENDATIONS	14
APPENDIX A - CHECK LIST OF VISUAL INSPECTION REPORT	
APPENDIX B - CHECK LIST OF ENGINEERING DATA	
APPENDIX C - PHOTOGRAPHS	
APPENDIX D - HYDROLOGY AND HYDRAULIC CALCULATIONS	
APPENDIX E - PLATES	
APPENDIX F - GEOLOGIC REPORT	

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

SHEPPARD DAM

NDI-ID NO. PA-00333
DER-ID NO. 1-071

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

A. Authority

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspections of dams throughout the United States.

B. Purpose

The purpose of this inspection is to determine if the dam constitutes a hazard to human life and property.

1.2 DESCRIPTION OF PROJECT

A. Description of Dam and Appurtenances

Sheppard Dam is an earthfill dam with a maximum embankment height of 23 feet. The top of the dam is 300 feet long, not including a 42.5 foot wide spillway located in the right abutment. The spillway consists of a concrete ogee section with a crest elevation at 4.5 feet below the design crest elevation of the embankment. The spillway channel has nearly vertical concrete walls over its full length. The bottom of the spillway is paved directly below the spillway and near the end of the chute. Natural rock forms the bottom of the chute between these two paved sections. A 24-inch cast iron pipe with an upstream gate control located in an intake tower can be used for blow off. This pipe discharges into the spillway chute.

B. Location: Union Township, Adams County
U.S.G.S. Quadrangle - McSherrystown, Pa.
Latitude 39°-45.8', Longitude 77°-00.9'
Appendix E, Plates I & II

C. Size Classification: Small: Height - 23 feet
Storage - 89 acre-feet

D. Hazard Classification: Significant (Refer to Section 3.1.E.)

E. Ownership: Peter H. Sheppard
101 Philadelphia Street
Hanover, PA 17331

F. Purpose: Recreation

G. Design and Construction History

The dam and its facilities were designed in 1934 by Albright & Friel, Inc., Philadelphia, Pennsylvania. A permit for construction was issued by the Water & Power Resources Board on August 8, 1934. Construction started immediately and was completed by the end of the year. Mr. P.H. Sheppard constructed the dam with a force account under the supervision of the design engineer.

H. Normal Operating Procedures

All inflow above normal pool level is discharged through the spillway. There are no operating procedures for the use of the blow off pipe. A pool level at spillway crest elevation is desired by the owner.

1.3 PERTINENT DATA

A. Drainage Area (square miles)

From files:	1.7
Computed for this report:	1.7
Use:	1.7

B. Discharge at Dam Site (cubic feet per second)
See Appendix D for hydraulic calculations

Maximum known flood (estimated from U.S.G.S. gage data for White Run at nearby Gettysburg, Pennsylvania)	1000
--	------

Outlet works at low-pool Elev. 580	30
------------------------------------	----

Outlet works at normal-pool Elev. 593	62
---------------------------------------	----

Spillway capacity at pool Elev. 597.4	1558
---------------------------------------	------

D. Elevation (feet above mean sea level)

Top of dam (low point)	597.4
------------------------	-------

Top of dam (design crest)	597.5
---------------------------	-------

Spillway crest	593.0
----------------	-------

Upstream portal invert	575.0									
Downstream portal invert	574.75±									
Streambed at downstream toe of dam (estimate)	574.0									
D. <u>Reservoir</u> (miles)										
Length of normal pool (Elev. 593.0)	.3									
Length of maximum pool (Elev. 597.4)	.4									
E. <u>Storage</u> (acre-feet)										
Spillway crest (Elev. 593.0)	61									
Top of dam (Elev. 597.4)	89									
F. <u>Reservoir Surface</u> (acres)										
Spillway crest (Elev. 593.0)	4.6									
Top of dam (Elev. 597.4)	8.7									
G. <u>Dam</u>										
Refer to Plates III & IV in Appendix E for plan and section.										
Type:	Earthfill.									
Length:	300 feet.									
Height:	23 feet.									
Top Width:	Design - 6 feet; Survey - 10 feet.									
Side Slopes:	<table border="0"> <thead> <tr> <th></th> <th><u>Design</u></th> <th><u>Surveyed</u></th> </tr> </thead> <tbody> <tr> <td>Upstream</td> <td>2.5H to 1V</td> <td>2.5H to 1V</td> </tr> <tr> <td>Downstream</td> <td>2.5H to 1V</td> <td>3.1H to 1V</td> </tr> </tbody> </table>		<u>Design</u>	<u>Surveyed</u>	Upstream	2.5H to 1V	2.5H to 1V	Downstream	2.5H to 1V	3.1H to 1V
	<u>Design</u>	<u>Surveyed</u>								
Upstream	2.5H to 1V	2.5H to 1V								
Downstream	2.5H to 1V	3.1H to 1V								
Zoning:	Plate III indicates impervious material placed on the upstream side.									
Cutoff:	Cutoff trench excavated to top of rock and backfilled with impervious material.									
Grouting:	None reported.									

H. Outlet Facilities

Type: 24-inch cast iron pipe encased in concrete.

Inlet: A 24-inch pipe at upstream toe. Flow controlled with slide gate on pipe located in control tower at upstream toe.

Outlet: Pipe discharges in spillway channel.

Location: 100 feet left of spillway.

I. Spillway

Type: Concrete ogee weir.

Length
of Weir: 42.5 at spillway crest, 44.5 feet at top of abutment walls.

Crest
Elevation: 593.0.

Location: Right abutment.

J. Regulating Outlets

See Section 1.3.H. above.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The engineering design data for Sheppard Dam are limited to the design drawings prepared by Albright & Friel, Inc., Philadelphia, Pennsylvania, and a report upon the application for a permit to construct this dam. This report was prepared by the Pennsylvania Department of Natural Resources (PennDER) and states that the design spillway flow was 1025 cfs with a 40 foot wide spillway and a depth of flow of 3.5 feet. The design freeboard is one foot. Test pits were excavated on the centerline dam indicating an overburden varying in depth from 4 to 6 feet. The report states that the overburden consisted of a fairly tight clay and hardpan. Borrow was to be obtained from the upper stretches of the reservoir.

2.2 CONSTRUCTION

Construction of the facilities was performed with local labor in 1934. The construction superintendent was Mr. Harry Lumadean, who had experience with other dam construction. The designer frequently observed the construction. Representatives of PennDER inspected the excavation of the cutoff trench and the foundation for the spillway weir and walls. The construction data is limited to PennDER inspection reports.

2.3 OPERATION

Records of operation have not been maintained by the owner.

2.4 EVALUATION

A. Availability

The available engineering and construction data are located in the files of PennDER at Harrisburg, Pennsylvania. There are no "as built" drawings.

B. Adequacy

The available engineering data combined with the visual inspection are considered to be sufficiently adequate to make a reasonable assessment of the dam.

C. Operating Records

Operating records, including maximum pool levels, have not been maintained by the owner.

D. Post Construction Changes

The visual inspection does not indicate that post construction changes have been made.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

A. General

The general appearance of Sheppard Dam is good. The downstream slope and top of embankment has a good grass cover. A heavy growth of weeds is on the upstream slope. The control tower at the upstream toe has a manhole. It is apparent that the manhole on this structure has not been opened in many years. The spillway is in good condition, except that weeds have grown up in the unpaved section.

The visual inspection check list and sketches of the general plan and profile of the dam, as surveyed during the inspection, are presented in Appendix A of this report.

Photographs taken on the day of inspection are reproduced in Appendix C. Mr. Peter Sheppard, owner, accompanied the inspectors on the day of the inspection.

B. Embankment

The upstream slope is protected with a limestone riprap. A fairly heavy growth of weeds has been permitted to develop near the waters' edge. The top of the embankment and the downstream slope have an excellent appearance with a well maintained grass mat. The downstream slope is flat and there were no signs of instability or seepage. The junctions at the abutments were good. The profile (Plate A-II, Appendix A) indicates that the profile is one-tenth of a foot below the design crest elevation over a length of about 130 feet.

A five foot deep depression is located about 60 feet beyond the toe of the dam. It was reported that water is sometimes standing in this hole. The hole was dry at the time of this inspection. It is probably fed by springs located on the left hillside and has no significance.

C. Appurtenant Structures

The forebay of the spillway is located near the right abutment. A heavy tree trunk was partially obstructing free flow in this area. The concrete of the weir and spillway walls is in good condition. Only a small section of the spillway bottom has been paved. Most of the area is formed by rather jagged natural rock with some weeds starting to develop with the chance of obstruction to flow discharge. At the end of the spillway is a small pool with a steel fish grating at the downstream end (Photographs No. 6 & No. 7). The observed details of the spillway chute vary from the design drawings. Sloped walls have been continued over the full length of the chute and the small pool at the end is not shown on design drawings.

The control tower (Photograph No. 8) is located near the upstream toe and is accessible only by boat. The gate control in this structure, to operate the blow off, has not been used in at least 20 years. The blow-off pipe outlets into the spillway discharge channel. This is a variation from the design drawings.

D. Reservoir Area

The reservoir is surrounded by woodlands. The slopes are flat and appear to be stable. The amount of sedimentation is unknown, and does not appear to be a problem.

E. Downstream Channel

The immediate downstream channel consists of a dry natural stream at the time of inspection. The slopes are moderate and stable. The stream passes under a rural road bridge about 2500 feet downstream from the dam. The valley widens to a flat area downstream of this bridge and is closed off by State Route 194 which crosses the creek with a bridge. Failure of the Sheppard Dam due to overtopping creates a potential hazard for the loss of life of transient people on the highway as well as the loss of the roadway bridges. The hazard category for Sheppard Dam is considered to be significant.

3.2 EVALUATION

The overall visual evaluation of the facilities indicate that the dam is in good condition. It is recommended that the weed growth on the upstream slope and in the spillway channel be controlled. The tree trunk in the forebay area should be removed.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Sheppard Dam and its reservoir were constructed for recreation as a fish pond. Operational procedures do not exist, and all inflow above the normal pool level is permitted to discharge through the spillway.

4.2 MAINTENANCE OF DAM

The top of the dam and the downstream slope are protected with a well maintained grass mat. The downstream toe is clear of any brush and weeds. The upstream slope has a growth of weed over its full length.

4.3 MAINTENANCE OF OPERATING FACILITIES

The only operating facility is the sliding gate in the control tower which is used to control the discharge through the blow off pipe. This gate has not been maintained or operated over at least 20 years.

4.4 WARNING SYSTEM

There is no formally organized surveillance and downstream warning system in existence at the present time. The owner resides on the hill on the right side of the reservoir.

4.5 EVALUATION

The operational procedures for Sheppard Dam are minimal at the present time. Although the dam is in good condition, operational procedures should include the clearing of brush in the spillway and upstream slope at regular intervals. The sliding gate in the control tower should be maintained and operated periodically. A formal surveillance and downstream warning system should be developed for implementation during periods of high or prolonged rainfall.

SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

A. Design Data

The hydrologic and hydraulic analysis available from PennDER for Sheppard Dam is limited. The files contained no stage-discharge curve, stage-storage curve, design flood hydrograph or flood routings. The files contain a statement that the designed spillway had a capacity of 1025 cfs with 1.0 foot of freeboard.

Design drawings contained in the PennDER files indicate that the spillway was a 40' long ogee weir. These drawings also indicate that the drawdown facilities consisted of a concrete encased 24-inch cast iron pipe through the embankment with closure at the upstream side by a 24-inch slide gate.

B. Experience Data

There are no records of flood levels at Sheppard Dam. Based on records of the U.S.G.S. stream gage on White Run near Gettysburg, Pennsylvania, the maximum inflow to Sheppard Dam is estimated to be 1000 cfs.

C. Visual Observation

It was noted that the intake tower and control for the drawdown facilities is accessible only by boat. A large tree trunk was partially obstructing the spillway ogee section. Brush and weeds were growing in the spillway channel. No other conditions were observed that would indicate that the appurtenant structures of the dam could not operate satisfactorily during a flood event.

D. Overtopping Potential

Sheppard Dam has a total storage capacity of 89 acre-feet and the overall height is 23 feet above the streambed. These dimensions indicate a size classification of "Small." The hazard classification for this dam is "Significant" (see Section 3.1.E.).

The Spillway Design Flood (SDF) for a dam having the above classification should be in the range of the 100 year flood to one-half the Probable Maximum Flood (PMF). Since the downstream area is not populated, the recommended SDF for this dam is the 100 year flood. For this dam the SDF peak inflow is 1155 cfs (see Appendix D for hydraulic calculations).

Comparison of the estimated SDF peak inflow of 1155 cfs with the estimated total discharge capacity of 1558 cfs indicates that a potential for overtopping of the Sheppard Dam does not exist.

An estimate of the storage effect of the reservoir and routing of the computed inflow hydrograph through the reservoir shows that this dam has the necessary storage available to pass the SDF with about 0.9 foot of freeboard.

E. Spillway Adequacy

The small size and significant hazard categories, in accordance with the Corps of Engineers' criteria and guidelines, indicates that the SDF for this dam should be in the range of the 100 year flood to one-half the PMF. The recommended SDF is the 100 year flood.

Calculations show that the total spillway discharge capacity and reservoir storage capacity, based on the present low point of the dam profile, combine to handle the SDF without overtopping the dam (refer to Appendix D). The SDF can be passed with about 0.9 foot of freeboard.

Since the total spillway discharge and reservoir storage capacity can pass the SDF without overtopping the dam, the spillway is considered to be adequate.

The hydrologic analysis for this investigation was based upon existing conditions of the watershed. The effects of future development were not considered.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

A. Visual Observations

1. Embankment

The visual inspection of Sheppard Dam did not detect any signs of embankment instability or seepage. The field survey indicates that the slopes are equal to or flatter than the proposed slopes on the design drawings. The slopes are considered to be adequate for the height of the dam under consideration. The profile of the dam indicates that the crest is fairly level with a low point near its center.

2. Appurtenant Structures

The spillway was in apparent good condition. Deterioration of the concrete has not occurred and the walls did not show signs of cracking or movement. The unpaved spillway appears to be in good condition without excessive deterioration of the exposed rock. The control tower was not inspected.

B. Design and Construction Data

1. Embankment

Inspection reports by PennDER indicate that the cutoff trench was excavated to solid rock. Due to the jagged shape of the rock surface, the small key trench was omitted in the area extending from the blow-off pipe to the left abutment. Reports indicate that the full embankment section was constructed with a good clay material rather than the zoned fill shown on the design drawing. The clay was to be placed in six inch layers and compacted with a 10 ton roller. A downstream toe drain is shown on the drawings. The ground surface was stripped of topsoil prior to placing embankment fill.

2. Appurtenant Structures

The design drawings indicate a five foot wide unreinforced concrete base for the ogee section. The spillway walls have a 2 foot wide base for heights of four feet. The footings were probably keyed in the rock and the design dimensions appear to be adequate. There are no indications that cutoff walls were constructed behind the spillway walls. Seepage, however, was not observed. The spillway slab, over the short section it was placed, does not have the depression shown on Plate IV, Appendix E. The cast iron blow off pipe was encased in concrete and has two cutoff collars at the upstream end.

C. Operating Records

Operating records for this dam have not been maintained by the owner. There are no indications that problems have been encountered.

The depression beyond the downstream toe was reported in 1946 in a PennDER inspection report. This report stated that the hole was fed by springs located high on the slope below the left end of the dam and that there were no signs of leakage through the embankment.

D. Post Construction Changes

There are no records of changes to the embankment or its appurtenant structures.

E. Seismic Stability

This dam is located in Seismic Zone 1, and it is considered that the static stability is sufficient to withstand minor earthquake-induced dynamic forces. No studies or calculations have been made to confirm this assumption.

SECTION 7 - ASSESSMENT AND RECOMMENDATIONS

7.1 DAM ASSESSMENT

A. Safety

The visual inspection of the dam and the review of the construction drawings indicate that Sheppard Dam is in good condition and has been constructed in accordance with acceptable engineering practices. The field inspection did not detect any signs of instability.

The hydrologic and hydraulic computations indicate that the combination of storage capacity and the spillway discharge capacity is able to pass the SDF without overtopping the dam, and that the spillway is adequate.

B. Adequacy of Information

The design information contained in the files combined with the visual inspection are considered sufficiently adequate for making a reasonable assessment of this dam.

C. Urgency

The recommendations presented below should be implemented immediately.

D. Additional Studies

Additional studies are not required at this time.

7.2 RECOMMENDATIONS

In order to assure the continued satisfactory operation of this dam, the following recommendations are presented for immediate implementation by the owner:

1. That the tree trunk in the forebay area be removed.
2. That the sliding gate in the intake tower be maintained and operated on a regular basis to ensure its functioning in time of an emergency.
3. That the weed growth on the upstream slope and in the spillway outlet channel be removed on at least an annual basis.
4. That a formal surveillance and downstream warning system be developed for use during periods of high or prolonged rainfall.

5. That an operation and maintenance manual be prepared for guidance in the operation of the dam during normal and emergency conditions, and that a schedule be developed for the annual inspection of the dam and its appurtenant structures.

APPENDIX A
CHECK LIST OF VISUAL INSPECTION REPORT

APPENDIX A

CHECK LIST

PHASE I - VISUAL INSPECTION REPORT

PA DER # 1-71

NDI NO. PA-00 333

NAME OF DAM Sheppard Dam HAZARD CATEGORY Significant

TYPE OF DAM Earthfill

LOCATION Union TOWNSHIP Adams COUNTY, PENNSYLVANIA

INSPECTION DATE 10/9/80 WEATHER Clear, sunny TEMPERATURE 78°F

INSPECTORS: R. Houseal (Recorder) OWNER'S REPRESENTATIVE(s):

H. Jongsma

P.H. Sheppard

R. Shireman

A. Bartlett

NORMAL POOL ELEVATION: 593.0 AT TIME OF INSPECTION: _____

BREAST ELEVATION: Design 597.50 POOL ELEVATION: 592.6

SPILLWAY ELEVATION: 593.0 TAILWATER ELEVATION: _____

MAXIMUM RECORDED POOL ELEVATION: No records

GENERAL COMMENTS:

The appearance of the dam embankment is excellent. The spillway channel, in the natural rock excavated area, needs to be cleared of brush. A large tree should be removed from the spillway forebay.

There was no evidence of distress or seepage.

One large 5'± deep x 30' x 20' depression is located about 60-70 feet beyond the toe of the downstream slope. Its origin is unknown. It was moist on the bottom.

VISUAL INSPECTION
EMBANKMENT

	OBSERVATIONS AND REMARKS
A. SURFACE CRACKS	None observed.
B. UNUSUAL MOVEMENT BEYOND TOE	None observed.
C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	None observed.
D. ALIGNMENT OF CREST: HORIZONTAL: VERTICAL:	Horizontal - Okay. Vertical - Refer to profile Plate A-II.
E. RIPRAP FAILURES	Riprap on upstream slope. Covered with heavy brush.
F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY	Left abuts with original ground - Okay. Right abuts with spillway wall - Okay.
G. SEEPAGE	None reported or observed.
H. DRAINS	None (check plans).
J. GAGES & RECORDER	None.
K. COVER (GROWTH)	Top and downstream slope grass covered and closely mowed - excellent condition. Upstream rock slope with heavy brush cover.

VISUAL INSPECTION
OUTLET WORKS

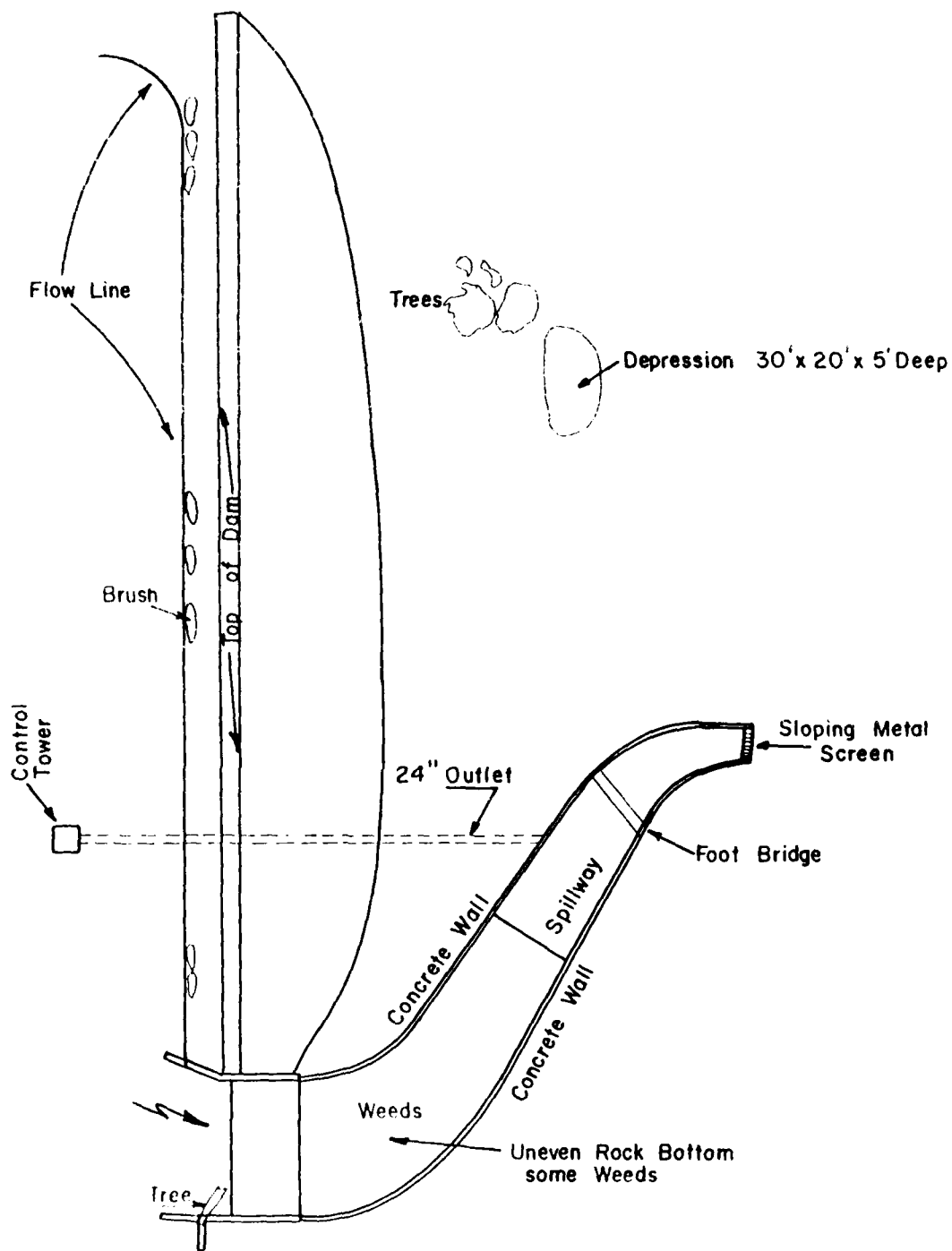
	OBSERVATIONS AND REMARKS
A. INTAKE STRUCTURE	Concrete tower upstream from embankment.
B. OUTLET STRUCTURE	Pipe through spillway outlet channel wall.
C. OUTLET CHANNEL	Same as spillway outlet channel.
D. GATES	Refer to drawings.
E. EMERGENCY GATE	Same as above.
F. OPERATION & CONTROL	Valve control tower was not inspected. Appears to be in need of some maintenance. Has not been operated in at least 20 years.
G. BRIDGE (ACCESS)	By boat from upstream embankment slope.

VISUAL INSPECTION
SPILLWAY

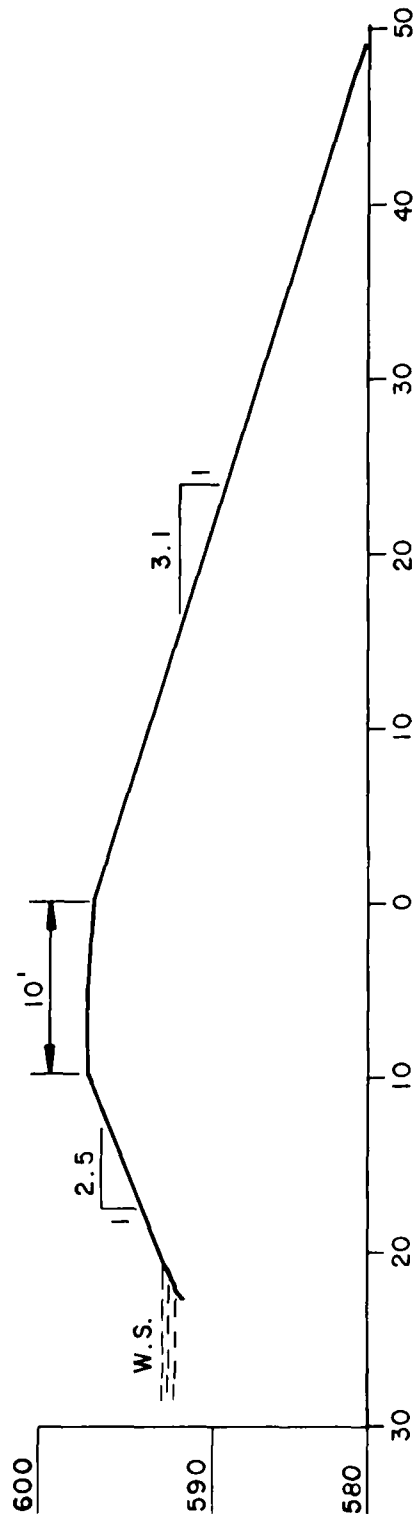
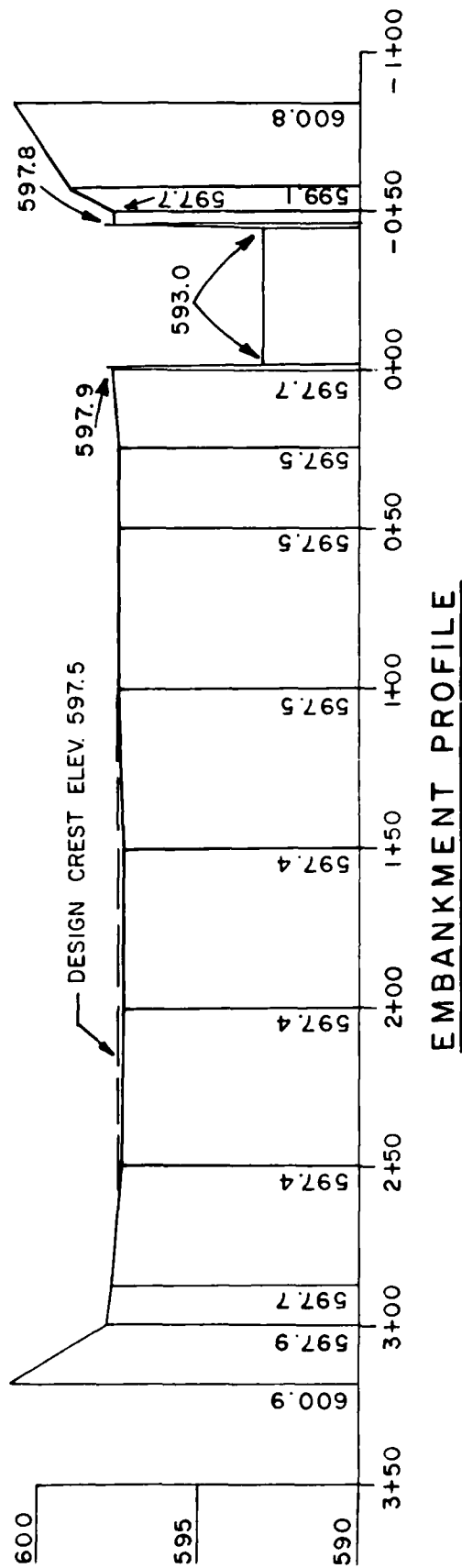
	OBSERVATIONS AND REMARKS
A. APPROACH CHANNEL	Spillway located at right side of embankment. Short curve in concrete walls leading to the spillway from the reservoir.
B. WEIR: Crest Condition Cracks Deterioration Foundation Abutments	Concrete ogee in good condition. Large tree "hung up" in spillway. None.
C. DISCHARGE CHANNEL: Lining Cracks Stilling Basin	Partially excavated into natural rock. Partially paved. Water in stilling basin; therefore, could not observe slabs. Walls over full length of spillway in good condition. Weeds and brush growing in rock portion of the channel.
D. BRIDGE & PIERS	None over spillway. Wooden footbridge across outlet channel.
E. GATES & OPERATION EQUIPMENT	None - spillway uncontrolled.
F. CONTROL & HISTORY	No records.

VISUAL INSPECTION

	OBSERVATIONS AND REMARKS
<u>INSTRUMENTATION</u>	
Monumentation	None.
Observation Wells	None.
Weirs	None.
Piezometers	None.
Staff Gauge	None.
Other	None.
<u>RESERVOIR</u>	
Slopes	Wooded, stable.
Sedimentation	Unknown.
Watershed Description	All woodlands.
<u>DOWNSTREAM CHANNEL</u>	
Condition	Natural stream - dry. Wide streambed just before Route 194.
Slopes	Moderate, stable.
Approximate Population	Varies. Public on Route 194.
No. Homes	No homes in floodplain over first five miles downstream.



SHEPPARD DAM
PA - 00333
INSPECTION SURVEY
PLATE A-I



EMBANKMENT SECTION

STA. 1+25

SURVEYED 10-9-80

SHEPPARD DAM
PA - 00333

INSPECTION SURVEY

PLATE A-II

APPENDIX B
CHECK LIST OF ENGINEERING DATA

APPENDIX B

CHECK LIST
ENGINEERING DATA

PA DER # 1-71

NDI NO. PA-00 333

NAME OF DAM Sheppard Dam

ITEM	REMARKS
AS-BUILT DRAWINGS	Design drawings only.
REGIONAL VICINITY MAP	U.S.G.S. Quadrangle - McSherrystown, PA See Plate II, Appendix E
CONSTRUCTION HISTORY	Permit issued August 8, 1934. Construction started same date, completed December, 1934. Constructed by force account under supervision of the designer. Cutoff trench and foundation inspected by DER.
GENERAL PLAN OF DAM	See Appendix E, Plate III.
TYPICAL SECTIONS OF DAM	See Appendix E, Plate IV.
OUTLETS: PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	Plates III & V, Appendix E. None recorded. Not available.

ENGINEERING DATA

ITEM	REMARKS
RAINFALL & RESERVOIR RECORDS	No records.
DESIGN REPORTS	Report by the designer, Albright & Friel, Inc., for permit application, stating that design discharge was 1025 cfs with one foot free board.
GEOLOGY REPORTS	None. Test pits on Plate III, Appendix E, show rock 4 feet below surface.
DESIGN COMPUTATIONS: HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Design discharge 1025 cfs. None. None.
MATERIALS INVESTIGATIONS: BORING RECORDS LABORATORY FIELD	No records.
POST CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	Described to be located at the upper portion of the basin.

ENGINEERING DATA

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	None.
HIGH POOL RECORDS	No records.
POST CONSTRUCTION ENGINEERING STUDIES & REPORTS	None, except inspection reports by PennDER in 1935, 1937, 1946, 1948, 1952, 1970 and 1971.
PRIOR ACCIDENTS OR FAILURE OF DAM Description: Reports:	None.
MAINTENANCE & OPERATION RECORDS	No records.
SPILLWAY PLAN, SECTIONS AND DETAILS	Plate III and V, Appendix E.

ENGINEERING DATA

ITEM	REMARKS
OPERATING EQUIPMENT, PLANS & DETAILS	24" outlet pipe closed at upstream end in wet well with sliding gate.
CONSTRUCTION RECORDS	4 reports by PennDER.
PREVIOUS INSPECTION REPORTS & DEFICIENCIES	Reported in excellent condition.
MISCELLANEOUS	

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Farmland

ELEVATION:

TOP NORMAL POOL & STORAGE CAPACITY: Elev. 593 Acre-Feet 61TOP FLOOD CONTROL POOL & STORAGE CAPACITY: Elev. Acre-Feet 89MAXIMUM DESIGN POOL: Elev. 596.50TOP DAM: Elev. 597.5 (Design)

SPILLWAY:

a. Elevation 593b. Type Concrete ogee.c. Width 42.5 feet.d. Length --e. Location Spillover Right abutment.f. Number and Type of Gates None.

OUTLET WORKS:

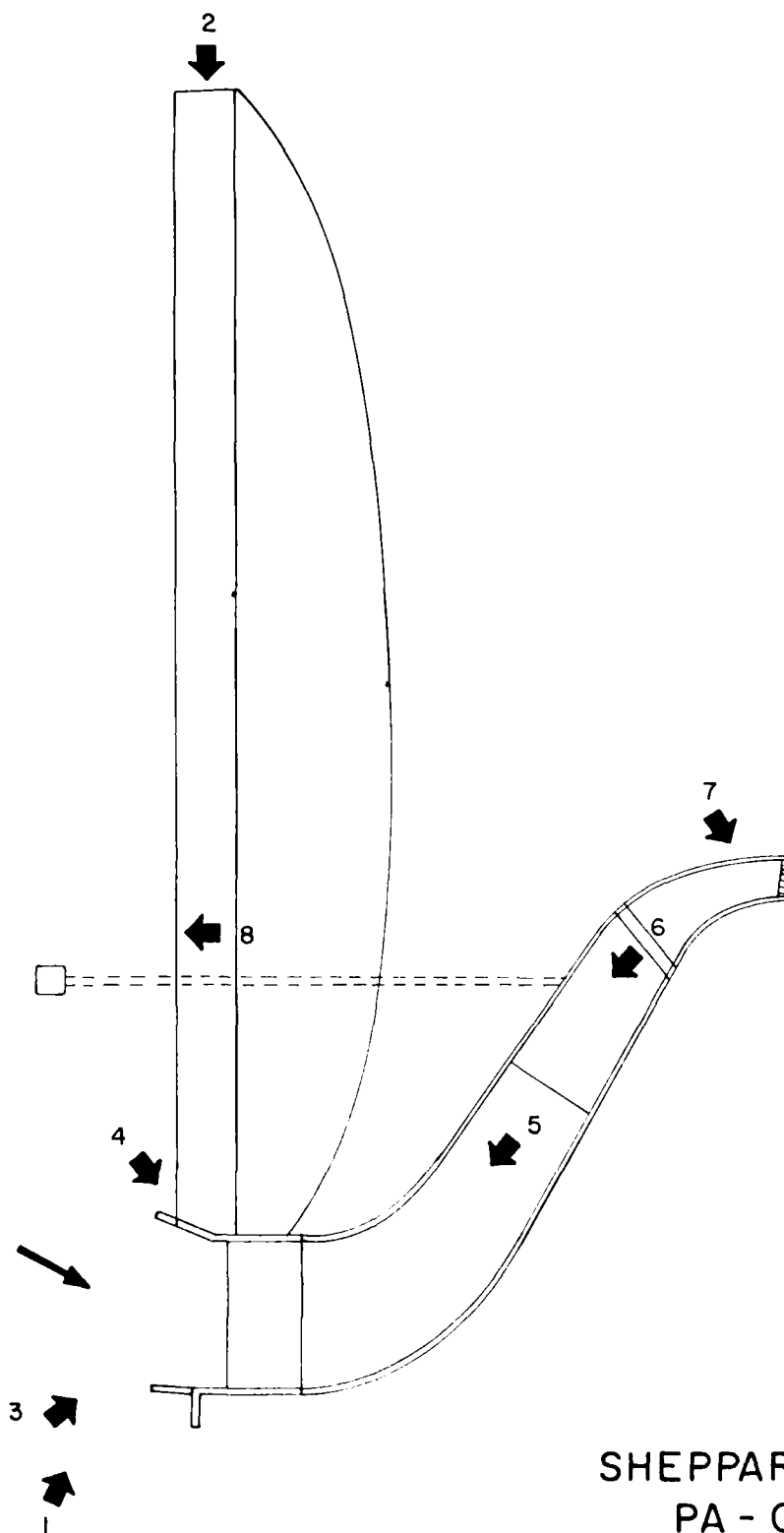
a. Type 24" cast iron pipe with 24" gate.b. Location Near center of dam.c. Entrance inverts 575d. Exit inverts 574.75e. Emergency drawdown facilities 24" cast iron pipe.

HYDROMETEOROLOGICAL GAGES:

a. Type None.b. Location c. Records MAXIMUM NON-DAMAGING DISCHARGE: 1558 cfs

APPENDIX C
PHOTOGRAPHS

APPENDIX C



SHEPPARD DAM
PA - 00333
KEY MAP OF PHOTOGRAPHS
PLATE C-I

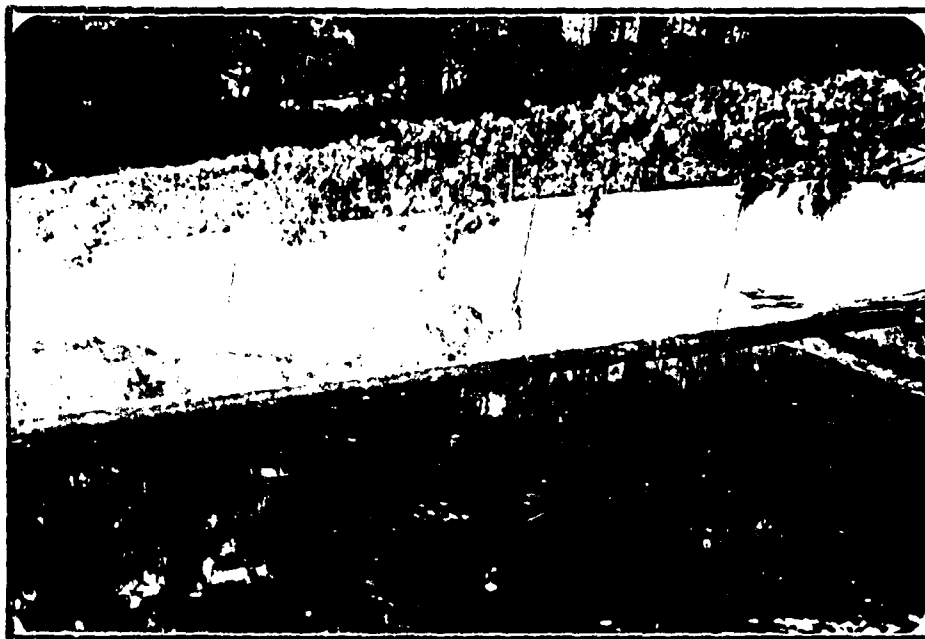


OVERVIEW FROM LEFT END - NO. 2
NOTE - WIDE CROTH ON UPS FREAM SLAP.



VIEW FROM RIGHT END - NO. 3
NOTE - THE TRENCH ON FOREWAY WALL

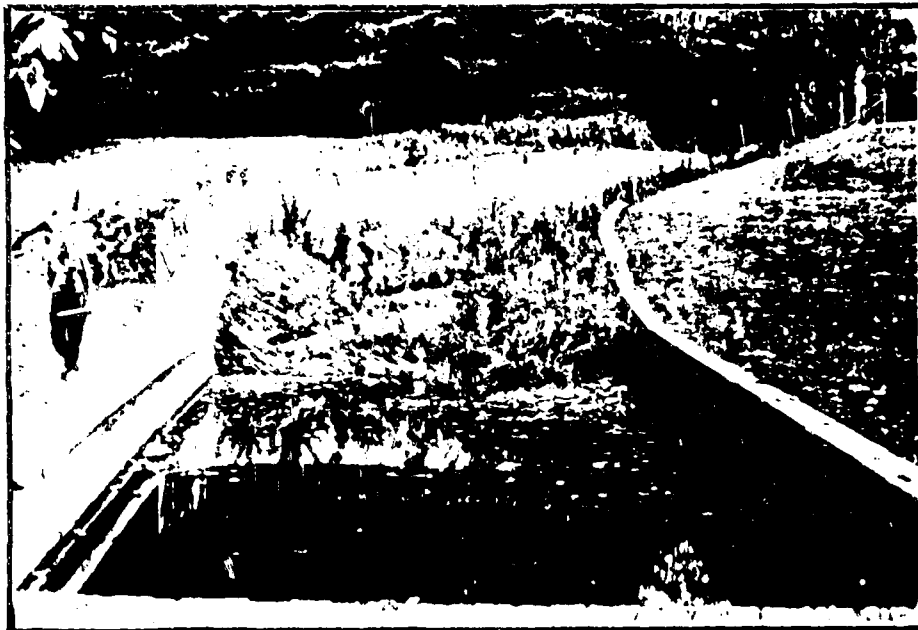
PA 0000
PL 0000



VIEW FROM FOREBAY AREA - NO. 4



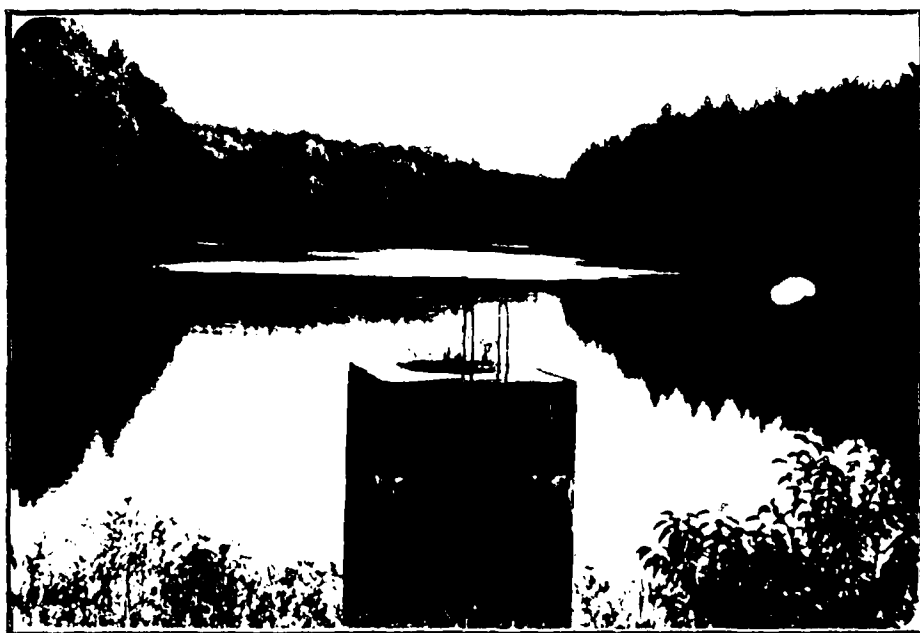
VIEW OF SPILLWAY CHANNEL LOOKING UPSTREAM - NO. 5



SETTLING BASIN AND SPILLWAY CHANNEL - NO. 6



END OF SETTLING BASIN WITH SCREEN - NO. 7



RESERVOIR AREA AND INTAKE STRUCTURE - NO. 8

PA-00333
Plate C-1

APPENDIX D
HYDROLOGY AND HYDRAULIC CALCULATIONS

SUMMARY DESCRIPTION
OF
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION

The hydrologic and hydraulic evaluation for this inspection report has employed computer techniques using the Corps of Engineers computer program identified as the Flood Hydrograph Package (HEC-1) Dam Safety Version.

The program has been designed to enable the user to perform two basic types of hydrologic analyses: (1) the evaluation of the overtopping potential of the dam, and (2) the capability to estimate the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. A brief summary of the computation procedures typically used in the dam overtopping analysis is shown below.

- Development of an inflow hydrograph to the reservoir.
- Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.
- Routing of the outflow hydrograph(s) of the reservoir to desired downstream locations. The results provide the peak discharge and maximum stage of each routed hydrograph at the outlet of the reach.

The output data provided by this program permits the comparison of downstream conditions just prior to a breach failure with that after a breach failure and the determination as to whether or not there is a significant increase in the hazard to loss of life as a result of such a failure.

The results of the studies conducted for this report are presented in Section 5.

For detailed information regarding this program refer to the Users Manual for the Flood Hydrograph Package (HEC-1) Dam Safety Version prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California.

BY DJR DATE 10/26/80

BERGER ASSOCIATES

SHEET NO. 1 OF 9

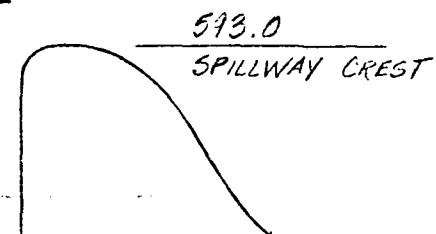
CHKD. BY RLS DATE 11/3/80

PROJECT D0590

SUBJECT SHEPPARD DAM

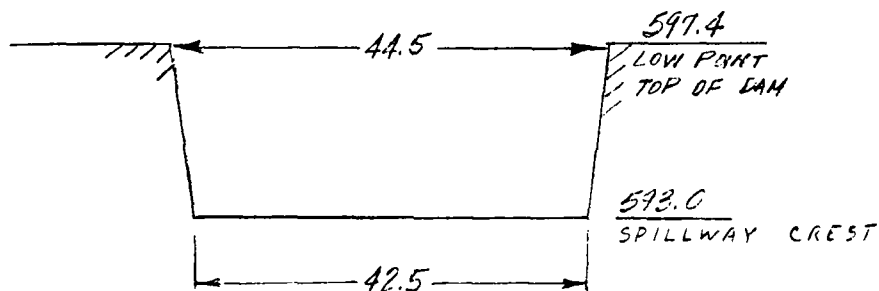
SPILLWAY RATING

FLOW →



Cgee SECTION

$C=3.88$ (SMALL DAMS, FIG. 249)



$$Q = CLH^{3/2}$$

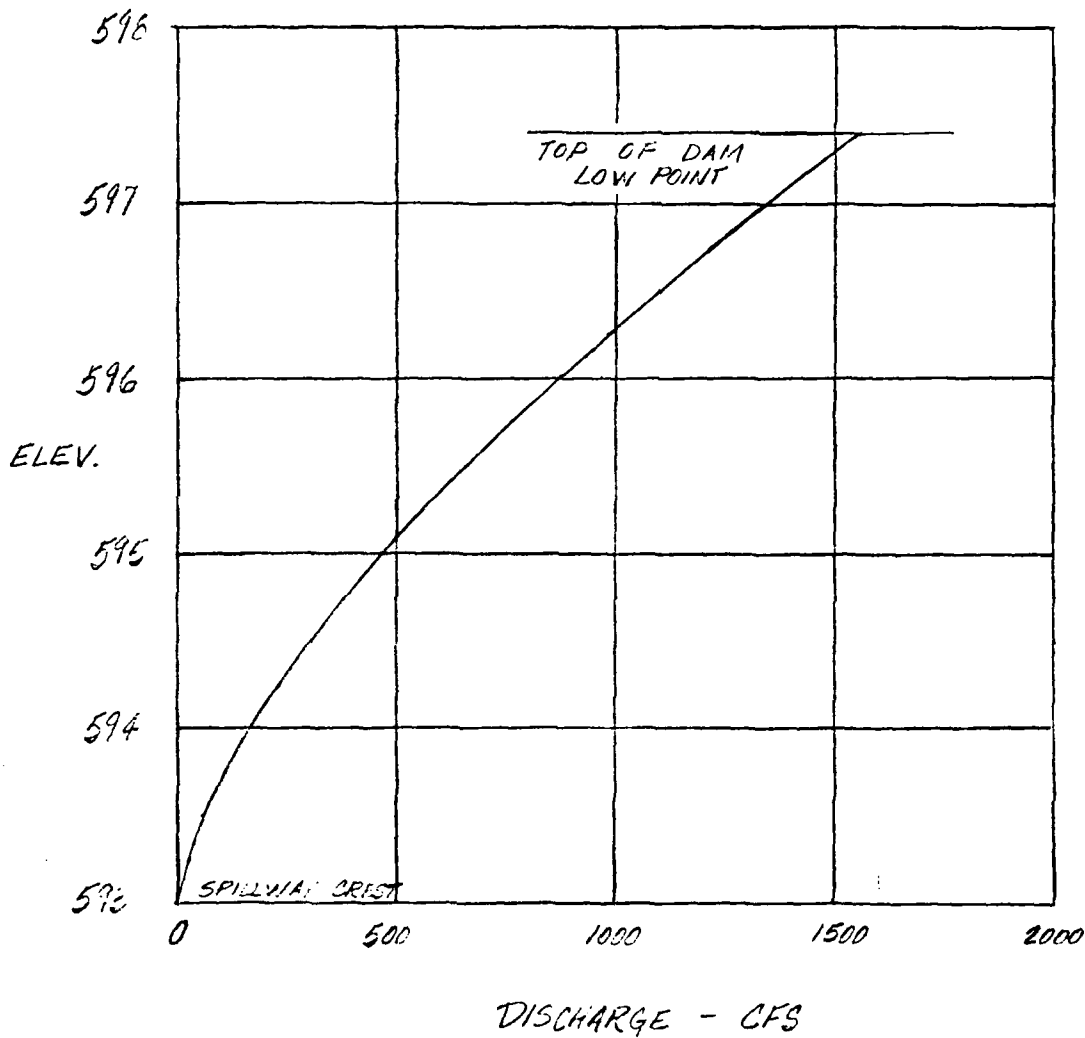
$$Q = 3.88 \times \frac{42.5 + 44.5}{2} \times (597.4 - 593)^{3/2} = 1556 \text{ cfs}$$

BY DJR DATE 10/29/80
CHKD. BY RLS DATE 11/3/81
SUBJECT SHEPPARD DAM

BERGER ASSOCIATES

SHEET NO. 2 OF 9
PROJECT D0590

SPILLWAY RATING CURVE



BY DJR DATE 10/29/80

BERGER ASSOCIATES

SHEET NO. 3 OF 9

CHKD. BY RLS DATE 11/3/80

PROJECT D0590

SUBJECT SHEPPARD DAM

EMBANKMENT RATING

$$Q = CLH^{3/2}$$

$$C = 2.7 \text{ (KINGS HDBK)}$$

AT ELEV. 596

$$2.7 \times 100 \times (.6)^{1.5} = 125$$

$$2.7 \times 50 \times (.55)^{1.5} = 55$$

$$2.7 \times 50 \times (.5)^{1.5} = 48$$

$$2.7 \times 50 \times (.4)^{1.5} = 34$$

$$2.7 \times 35 \times (.45)^{1.5} = 29$$

$$2.7 \times 15 \times (.2)^{1.5} = 4$$

$$\Sigma = 295 \text{ cfs}$$

AT ELEV. 599

$$2.7 \times 100 \times (1.6)^{1.5} = 546$$

$$2.7 \times 50 \times (1.55)^{1.5} = 261$$

$$2.7 \times 50 \times (1.5)^{1.5} = 248$$

$$2.7 \times 50 \times (1.4)^{1.5} = 224$$

$$2.7 \times 35 \times (1.45)^{1.5} = 165$$

$$2.7 \times 15 \times (1.2)^{1.5} = 53$$

$$2.7 \times 9 \times (.65)^{1.5} = 13$$

$$2.7 \times 7 \times (.55)^{1.5} = 8$$

$$\Sigma = 1518 \text{ cfs}$$

AT ELEV. 600

$$2.7 \times 100 \times (2.6)^{1.5} = 1132$$

$$2.7 \times 50 \times (2.55)^{1.5} = 550$$

$$2.7 \times 50 \times (2.5)^{1.5} = 534$$

$$2.7 \times 50 \times (2.4)^{1.5} = 502$$

$$2.7 \times 35 \times (2.45)^{1.5} = 362$$

$$2.7 \times 15 \times (2.2)^{1.5} = 132$$

$$2.7 \times 10 \times (1.6)^{1.5} = 55$$

$$2.7 \times 14 \times (1.05)^{1.5} = 41$$

$$2.7 \times 8 \times (.95)^{1.5} = 7$$

$$\Sigma = 3315 \text{ cfs}$$

AT ELEV. 601

$$\Sigma = 5569 \text{ cfs}$$

AT ELEV. 602

$$\Sigma = 8257 \text{ cfs}$$

BY DJR DATE 10/29/80 BERGER ASSOCIATES SHEET NO. 4 OF 9
 CHKD. BY RLS DATE 11/3/80 PROJECT D0590
 SUBJECT SHEPPARD DAM

DISCHARGE SUMMARY

ELEV.	SPILLWAY (CFS)	EMBANKMENT (CFS)	TOTAL (CFS)
593	0	0	0
594	166	0	166
595	471	0	471
596	871	0	871
597	1347	0	1347
597.4	1558	0	1558
598	1887	295	2182
599	2461	1518	3999
600	3126	3315	6441
601	3817	5569	9388
602	4557	8257	12814

BY DJR DATE 10/29/80

BERGER ASSOCIATES

SHEET NO. 5 OF 9

CHKD. BY RLS DATE 11/3/80

PROJECT D0590

SUBJECT SHEPPARD DAM

DISCHARGE THROUGH OUTLET WORKS

24" DIA. CAST IRON PIPE WITH 24" VALVE

$C = 0.6$

INVERT ELEV. = 575.0

$$Q = CA\sqrt{2gh}$$

AT POOL ELEVATION 593

$$h = 593 - 576 = 17$$

$$Q = 0.6 \times \pi \times (2)^2 / 4 \times \sqrt{2 \times 32.2 \times 17}$$

$$= 62 \text{ CFS}$$

AT LOW POOL ELEVATION 580.0

$$h = 580 - 576 = 4$$

$$Q = 0.6 \times \pi \times 2^2 / 4 \times \sqrt{64.4 \times 4}$$

$$= 30 \text{ CFS}$$

BY DJR DATE 10/22/80
CHKD. BY RLS DATE 11/3/80
SUBJECT SHEPPARD DAM

BERGER ASSOCIATES

SHEET NO. 6 OF 9
PROJECT D0590

MAXIMUM KNOWN FLOOD AT DAM SITE

THERE ARE NO RECORDS OF POOL LEVELS FOR THIS DAM.
BASED ON THE RECORDS OF THE GAGE ON WHITE RUN NEAR
GETTYSBURG, PA. (DA = 12.4 SQ MI) THE MAXIMUM DISCHARGE OF
4900 CFS OCCURRED IN OCTOBER, 1976. THE MAXIMUM INFLOW
TO SHEPPARD DAM IS ESTIMATED TO BE:

$$Q = \left(\frac{1.7}{12.4} \right)^{0.6} \times 4900 =$$
$$= 1000 \text{ CFS}$$

DESIGN FLOOD

SIZE CLASSIFICATION

MAXIMUM STORAGE = 89 ACRE FEET

MAXIMUM HEIGHT = 23 FEET

SIZE CLASSIFICATION IS "SMALL"

HAZARD CLASSIFICATION

SEVERAL BRIDGES AND A WATER TREATMENT PLANT
LOCATED WITHIN A MILE DOWNSTREAM.

USE "SIGNIFICANT"

RECOMMENDED SPILLWAY DESIGN FLOOD

THE ABOVE CLASSIFICATIONS INDICATE USE OF AN
SDF EQUAL TO THE 100 YR FLOOD TO ONE-HALF
THE PROBABLE MAXIMUM FLOOD.

BY RLS DATE 11/24/80
CHKD. BY DATE
SUBJECT

BERGER ASSOCIATES

SHEET NO. 7 OF 7
PROJECT D0590

SHEPPARD DAM

100 YR FLOOD

REF: "HYDROLOGIC STUDY, TROPICAL STORM
AGNES", U.S. ARMY, CORPS OF ENGINEERS, NAD.

DRAINAGE AREA = 1.7 SQ. MI.

$C_m = 2.0$

$\log(Q_m) = C_m + 0.75 \log(DA)$

$= 2.0 + 0.75 \log(1.7)$

$= 2.173$

$C_s = .342$

$S = C_s - .05 \log(DA)$

$= .342 - .05 \log(1.7)$

$= .330$

$g = +0.5$

$K(P, g) = 2.68572 \quad (100 \text{ YR})$

$\log(Q(P)) = \log(Q_m) + K(P, g)S$

$\log(Q_1) = 2.173 + 2.68572(.33)$

$= 3.059$

$Q_1 = 1146 \text{ CFS}$

BY PLS DATE 11/24/80
CHKD. BY DATE
SUBJECT

BERGER ASSOCIATES

SHEET NO. 8 OF 9
PROJECT D0590

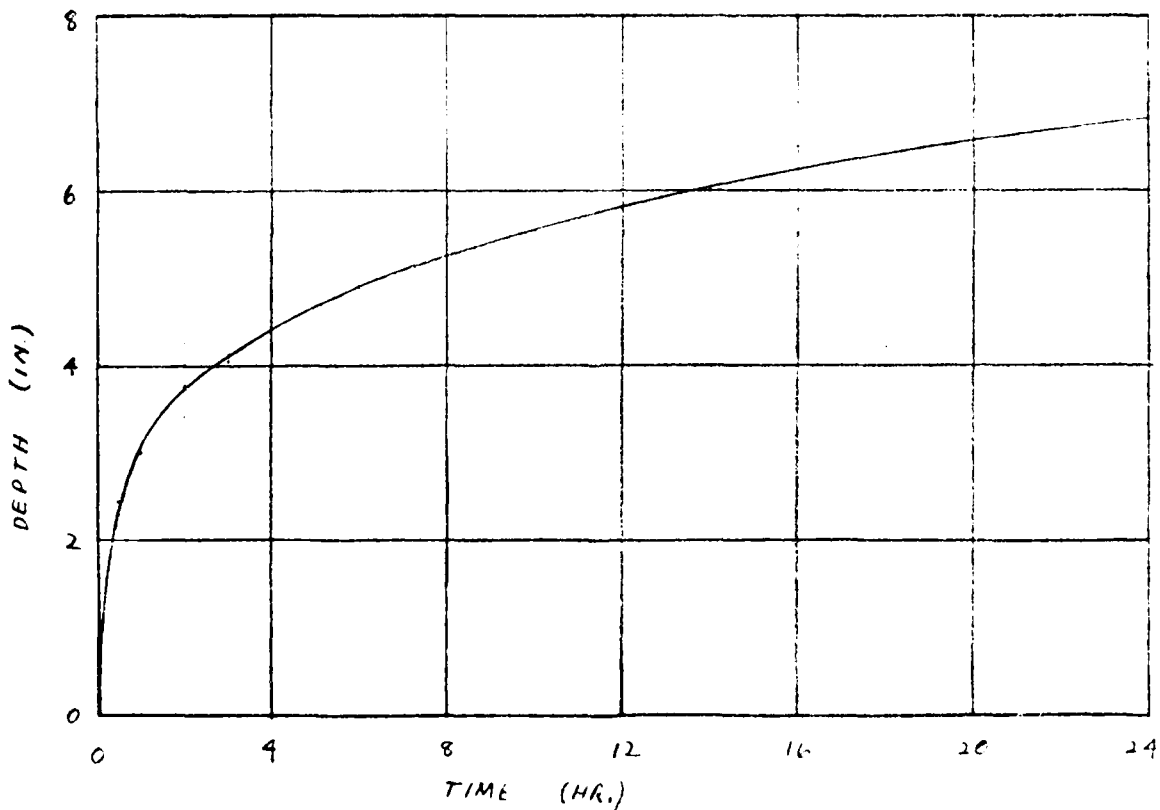
SHEPPARD DAM

100 YR FLOOD

(CONT.)

TOTAL RAINFALL (FROM TP-40)

DURATION (HR.)	DEPTH (IN.)
.5	2.45
1	3.0
2	3.75
3	4.05
6	4.9
12	5.8
24	6.8



RUNOFF $Q = 1155 \approx 1146$ CFS

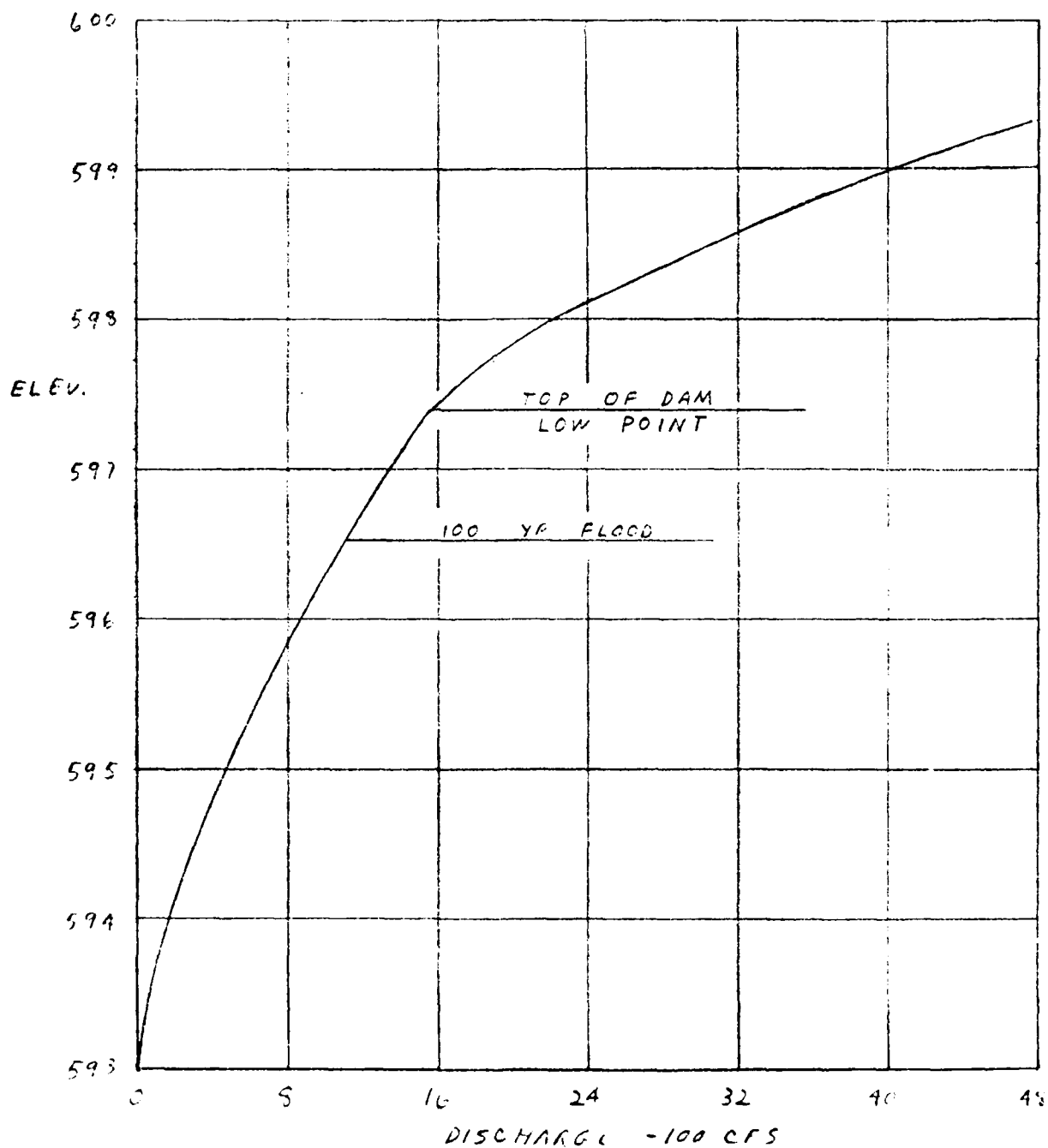
BY RL DATE 1/24/81
CHKD. BY DATE
SUBJECT

BERGER ASSOCIATES

SHEET NO. 9 OF 9
PROJECT D0590

SHEPPARD DAM

SPILLWAY CAPACITY CURVE



HYDROLOGY AND HYDRAULIC ANALYSIS DATA BASE

NAME OF DAM: SHEPPARD DAM RIVER BASIN: SUSQUEHANNA
 PROBABLE MAXIMUM PRECIPITATION (PMP) = 23.7 INCHES/24 HOURS ⁽¹⁾

(FOR FOOTNOTES SEE NEXT PAGE)

STATION		1	2	3	4
STATION DESCRIPTION		SHEPPARD LAKE	SHEPPARD DAM		
DRAINAGE AREA (SQUARE MILES)		1.7			
CUMULATIVE DRAINAGE AREA (SQUARE MILE)		1.7	1.7		
ADJUSTMENT OF PMP FOR DRAINAGE AREA (%) ⁽²⁾	6 HOURS	113			
	12 HOURS	123			
	24 HOURS	132			
	48 HOURS	142			
	72 HOURS	--			
	Zone 6				
SNYDER HYDROGRAPH PARAMETERS	ZONE ⁽³⁾	15A			
	C_p/C_t ⁽⁴⁾	.54/1.15			
	L (MILES) ⁽⁵⁾	2.48			
	L_{co} (MILES) ⁽⁵⁾	1.11			
	$T_p = C_f (L \cdot L_{co})^{0.3}$ (Hours)	1.56			
SPILLWAY DATA	CREST LENGTH (FT.)		42.5		
	FREEBOARD (FT.)		4.4		
	DISCHARGE COEFFICIENT		3.88		
	EXPONENT		1.5		
	ELEVATION		593		
AREA ⁽⁶⁾ (ACRES)	NORMAL POOL	4.6			
	ELEV <u> </u> ⁽⁷⁾	11.0			
	ELEV <u> </u>				
STORAGE (ACRE - FEET)	NORMAL POOL ⁽⁷⁾	61			
	ELEV <u>553.2</u> ⁽⁸⁾	0			
	ELEV <u> </u> ⁽⁸⁾				
	ELEV <u> </u> ⁽⁸⁾				

- (1) Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.
- (2) Hydrometeorological Report 33 (Figure 2), U.S. Army, Corps of Engineers, 1956.
- (3) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).
- (4) Snyder's Coefficients.
- (5) L = Length of longest water course from outlet to basin divide.
 L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.
- (6) Planimetered area encompassed by contour upstream of dam.
- (7) PennDER files.
- (8) Computed by conic method.

DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 01 APR 80

1/4

1	A1	SHEPPARD DAM **** UNNAMED TRIB. TO CONEWAGO CREEK									
2	A2	UNION TWP., ADAMS COUNTY, PA.									
3	A3	NDI # PA-00333 PA DER # 1-71									
4	B	300	0	15	0	0	0	0	0	-4	0
5	B1	5									
6	J	1	1	1							
7	J1	1									
8	K		1					1			
9	K1	INFLOW HYDROGRAPH									
10	H	1	1.7								
11	O	96									
12	O1	.01	.01	.02	.02	.02	.02	.02	.02	.02	.02
13	O1	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
14	O1	.02	.03	.03	.03	.03	.03	.03	.03	.03	.04
15	O1	.04	.04	.04	.04	.05	.05	.05	.05	.06	.06
16	O1	.07	.08	.08	.10	.12	.14	.22	.32	1.85	.60
17	G1	.28	.17	.12	.10	.08	.08	.08	.07	.06	.06
18	O1	.05	.05	.05	.04	.04	.04	.04	.03	.03	.03
19	O1	.03	.03	.03	.03	.03	.03	.02	.02	.02	.02
20	O1	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
21	O1	.02	.02	.02	.02	.01	.01				
22	T							1.5	.25		
23	W	1.56	.54								
24	X	-1.5	-.05	2							
25	K	1	2					1			
26	K1	RESERVOIR ROUTING									
27	Y			1							
28	Y1	1					61	-1			
29	Y4	593	594	595	596	597	597.4	598	599	600	601
30	Y5	0	166	471	871	1347	1558	2182	3999	6441	9368
31	\$A	0	4.6	11							
32	\$E	553.2	593	600							
33	\$S	593									
34	\$D	597.4									
35	K	99									

1

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	1
ROUTE HYDROGRAPH TO	2
END OF NETWORK	

FLOOD HYDROGRAPH PACKAGE (HEC-1)

DAM SAFETY VERSION JULY 1978

LAST MODIFICATION 01 APR 80

RUN DATE* 81/01/28.

TIME* 17.19.42.

SHEPPARD DAM **** UNNAMED TRIB. TO CONEWAGO CREEK
 UNION TWP., ADAMS COUNTY, PA.
 NDI # PA-00333 PA DER # 1-71

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IFRT	NSTAN
300	0	15	0	0	0	0	0	-4	0
			JOPER	NWT	LEOPT	TRACE			
			5	C	0	0			

RUN DATE# 81/01/28.
TIME# 17.19.42.

2/4

SHEPPARD DAM **** UNNAMED TRIB. TO CONEWAGO CREEK
UNION TWP., ADAMS COUNTY, PA.
NDI # PA-00333 PA DER # 1-71

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IFRT	NSTAN
300	0	15	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	1	1.70	0.00	1.70	0.00	0.000	0	0	0

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTICK	STRTL	CHSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.50	.25	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 1.56 CP= .54 NTA= 0

RECESSION DATA

STRTQ= -1.50 GRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 44 END-OF-PERIOD ORDINATES, LAG= 1.56 HOURS, CP= .54 VOL= 1.00

21.	78.	157.	244.	320.	367.	379.	351.	308.	269.
236.	206.	191.	158.	138.	121.	106.	93.	81.	71.
62.	55.	48.	42.	37.	32.	28.	25.	21.	19.
16.	14.	13.	11.	10.	8.	7.	6.	6.	5.
4.	4.	3.	3.						

0

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
-------	-------	--------	------	------	------	--------	-------	-------	--------	------	------	------	--------

SUM 6.60 3.35 3.45 15122.
(173.)(85.)(88.)(428.21)

HYDROGRAPH ROUTING

0
 MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q

SUM 6.80 3.35 3.45 15122.
 (173.)(85.)(88.)(428.21)

3/4

HYDROGRAPH ROUTING

RESERVOIR ROUTING

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	0	0	0	0

NSTPS	NSTD	LAG	AMSKK	X	TSK	STORA	ISFRAT
1	0	0	0.000	0.000	0.000	61.	-1

STAGE	593.00	594.00	595.00	596.00	597.00	597.40	598.00	599.00	600.00	601.00
FLOW	0.00	166.00	471.00	871.00	1347.00	1558.00	2182.00	3999.00	6441.00	9398.00

SURFACE AREA= 0. 5. 11.

CAPACITY= 0. 61. 114.

ELEVATION= 553. 593. 600.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
593.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COORD	EXPD	DAMWID
597.4	0.0	0.0	0.

PEAK OUTFLOW IS 1128. AT TIME 14.00 HOURS

1

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

RATIOS APPLIED TO FLOWS

OPERATION	STATION	AREA	PLAN	RATIO 1
				1.00
HYDROGRAPH AT	1	1.70	1	1155.
	(4.40)		(32.72)(
ROUTED TO	2	1.70	1	1128.
	(4.40)		(31.94)(

593.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

DAM DATA
TOPEL 597.4 COOD 0.0 EXPD 0.0 DAMWID 0.

4/4

PEAK OUTFLOW IS 1128. AT TIME 14.00 HOURS

1

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

RATIOS APPLIED TO FLOWS

OPERATION	STATION	AREA	PLAN	RATIO	1
					1.00
HYDROGRAPH AT	1	1.70	1	1155.	
	(4.40)	(32.72)	(
ROUTED TO	2	1.70	1	1128.	
	(4.40)	(31.94)	(

1

SUMMARY OF DAM SAFETY ANALYSIS

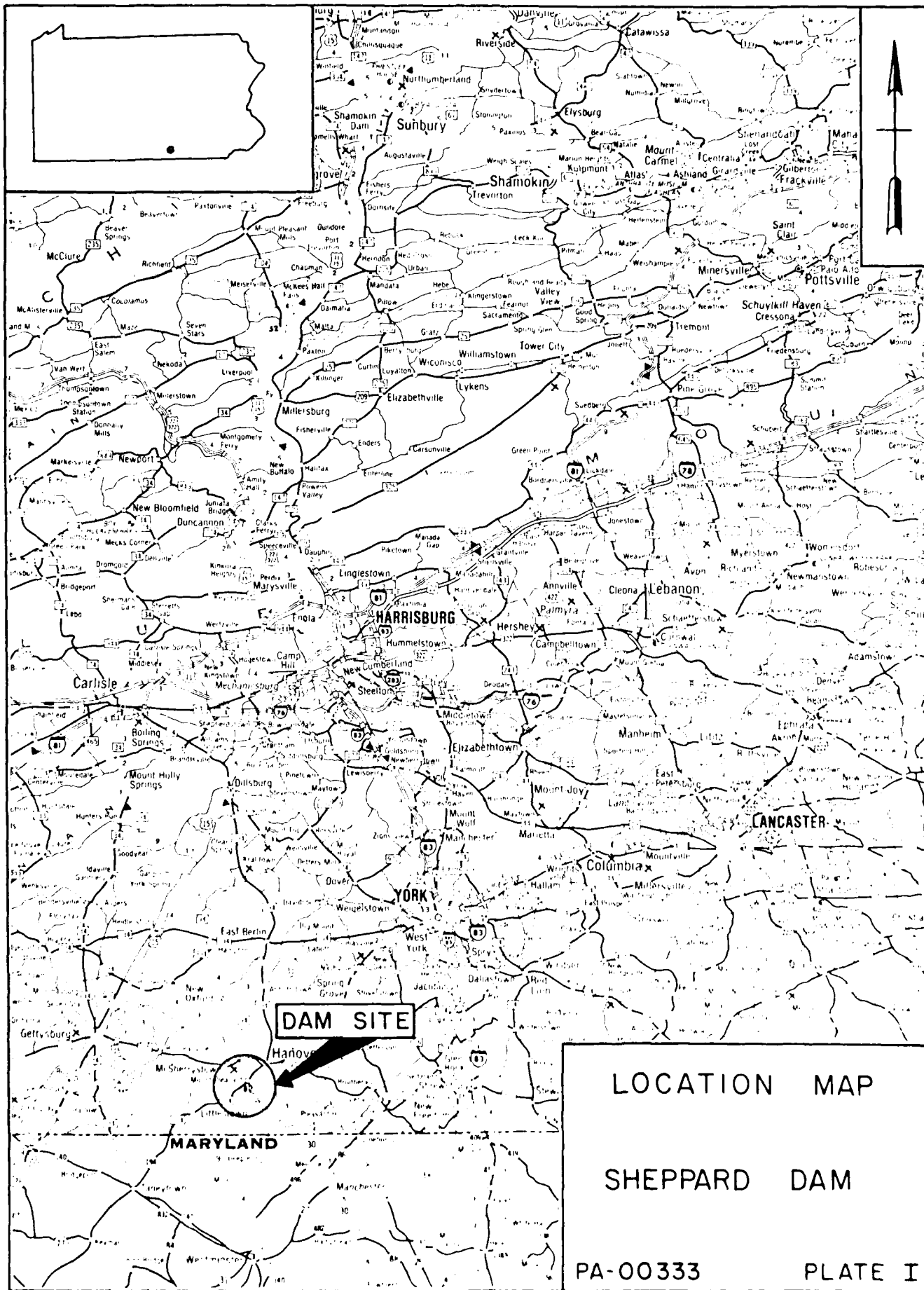
PLAN 1	ELEVATION	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	592.98		593.00	597.40
	61.		61.	89.
	0.		0.	1558.

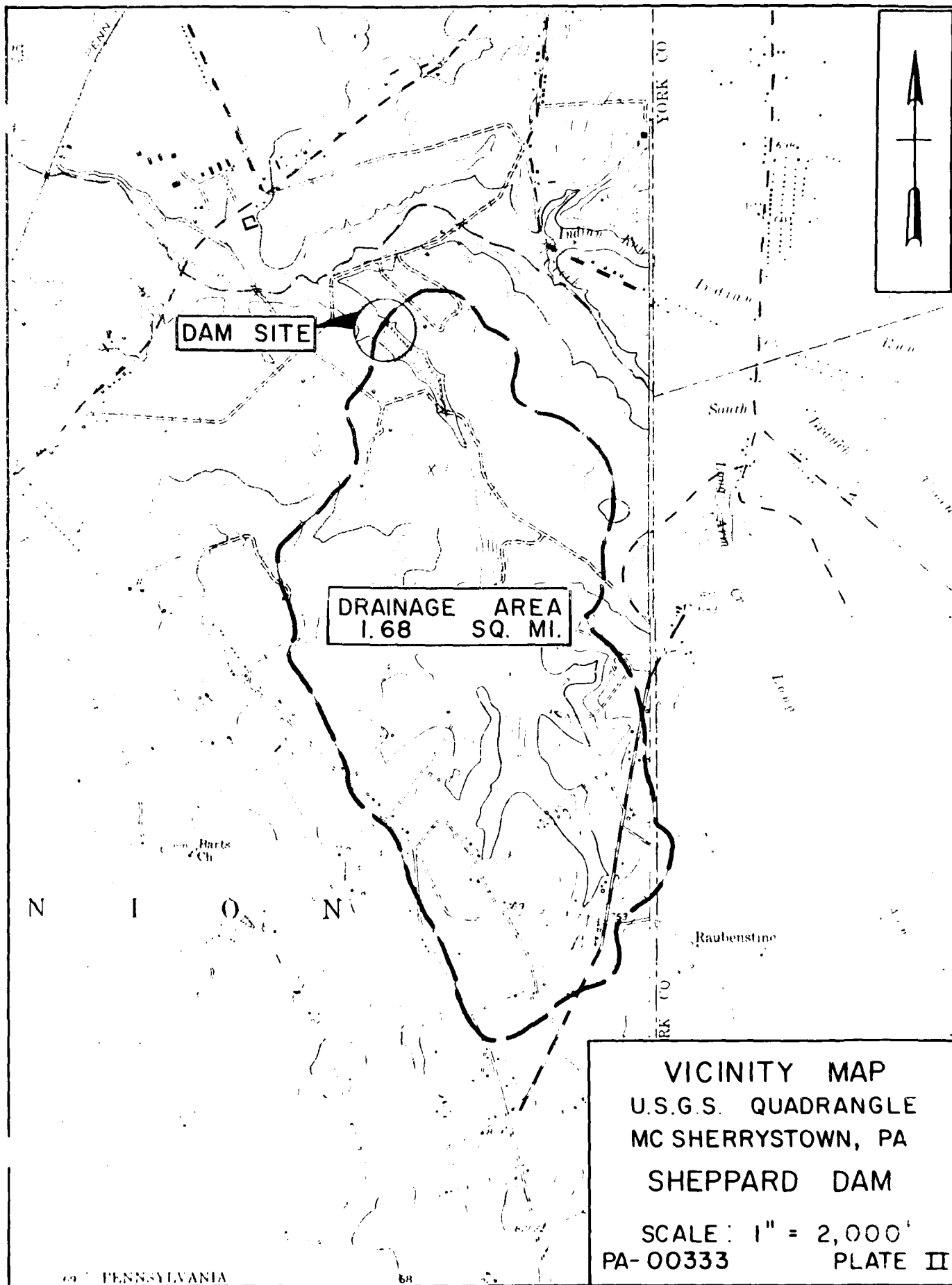
	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
EOI ENCOUNTERED.	1.00	596.54	0.00	82.	1128.	0.00	14.00	0.00

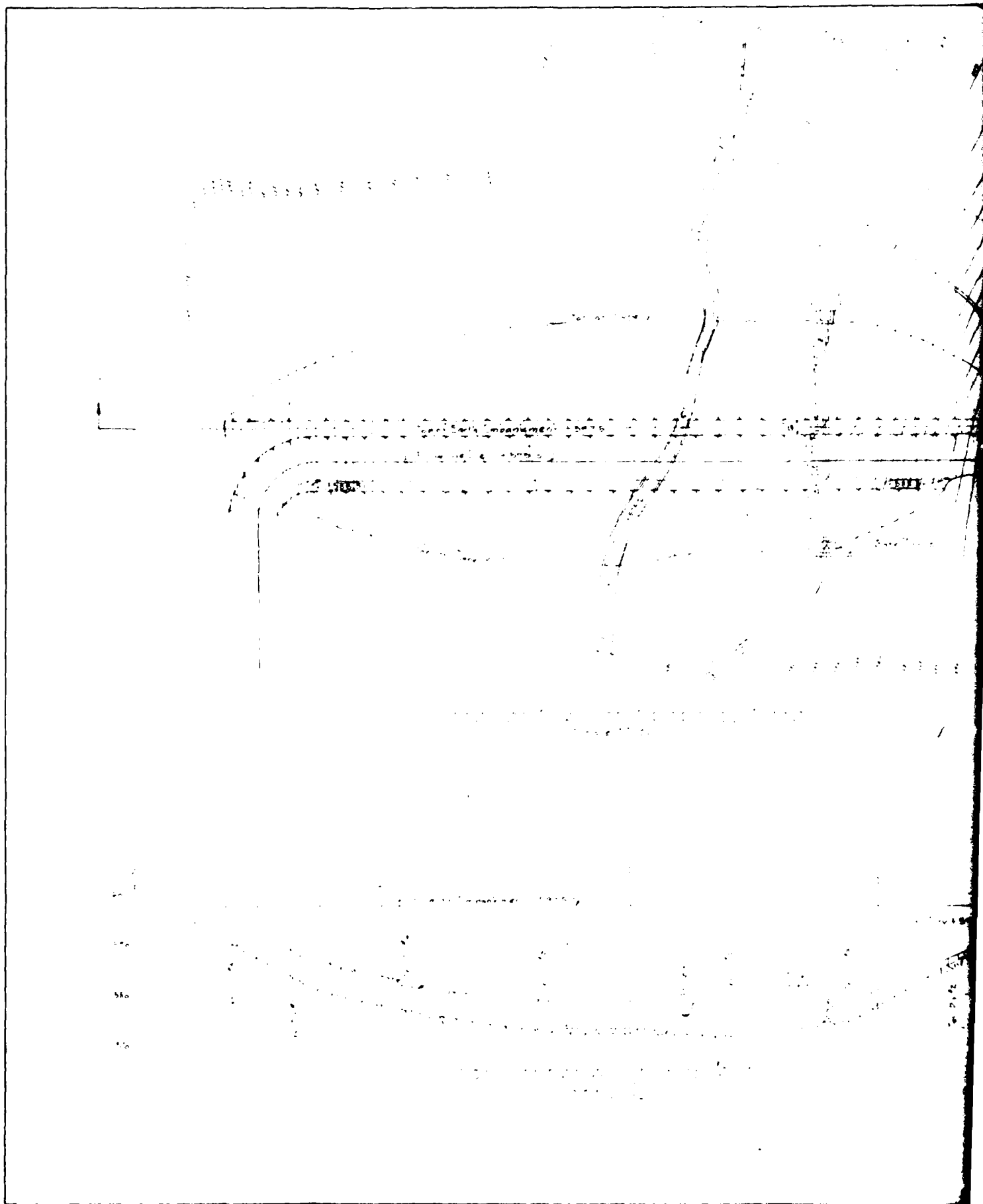
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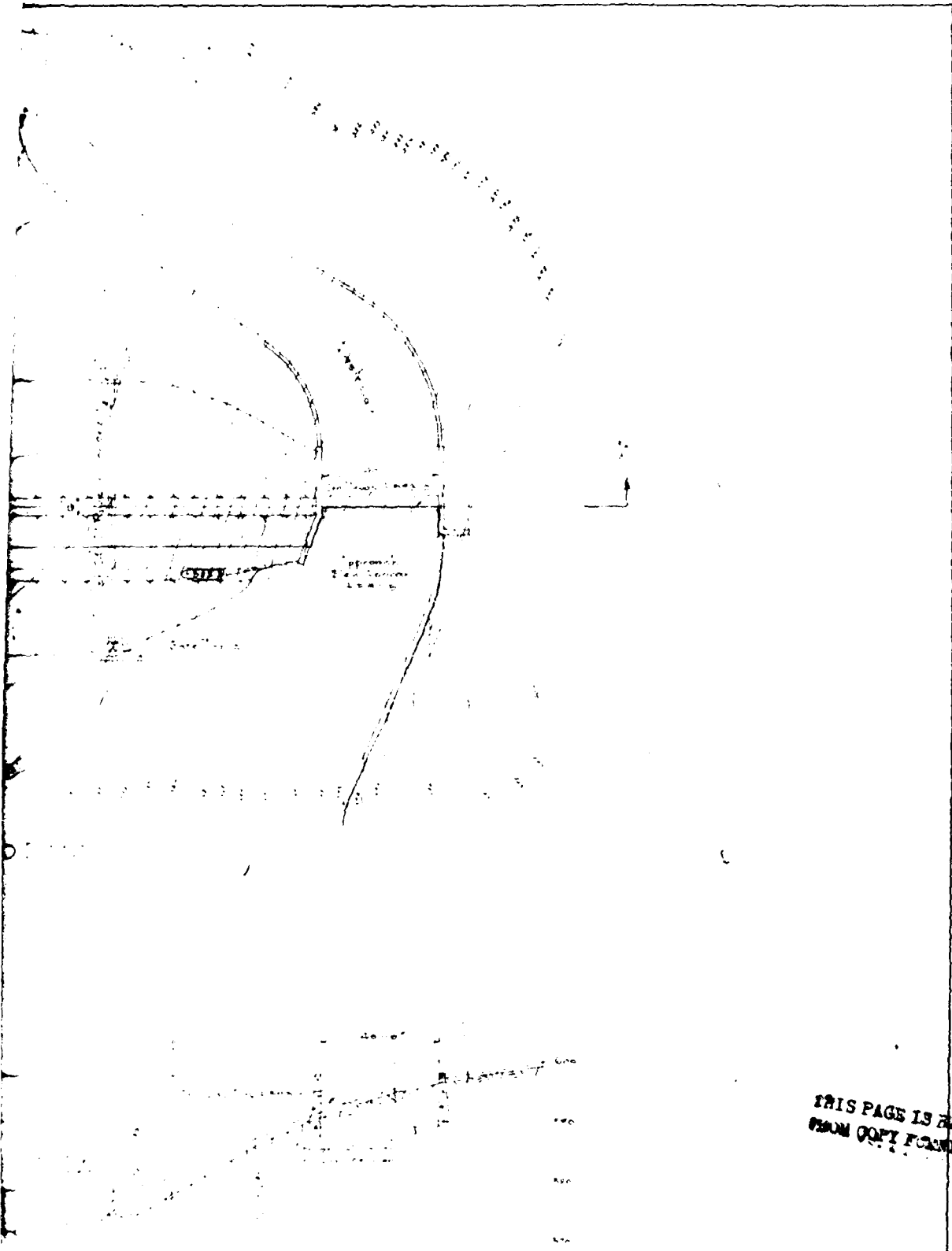
APPENDIX E

PLATES









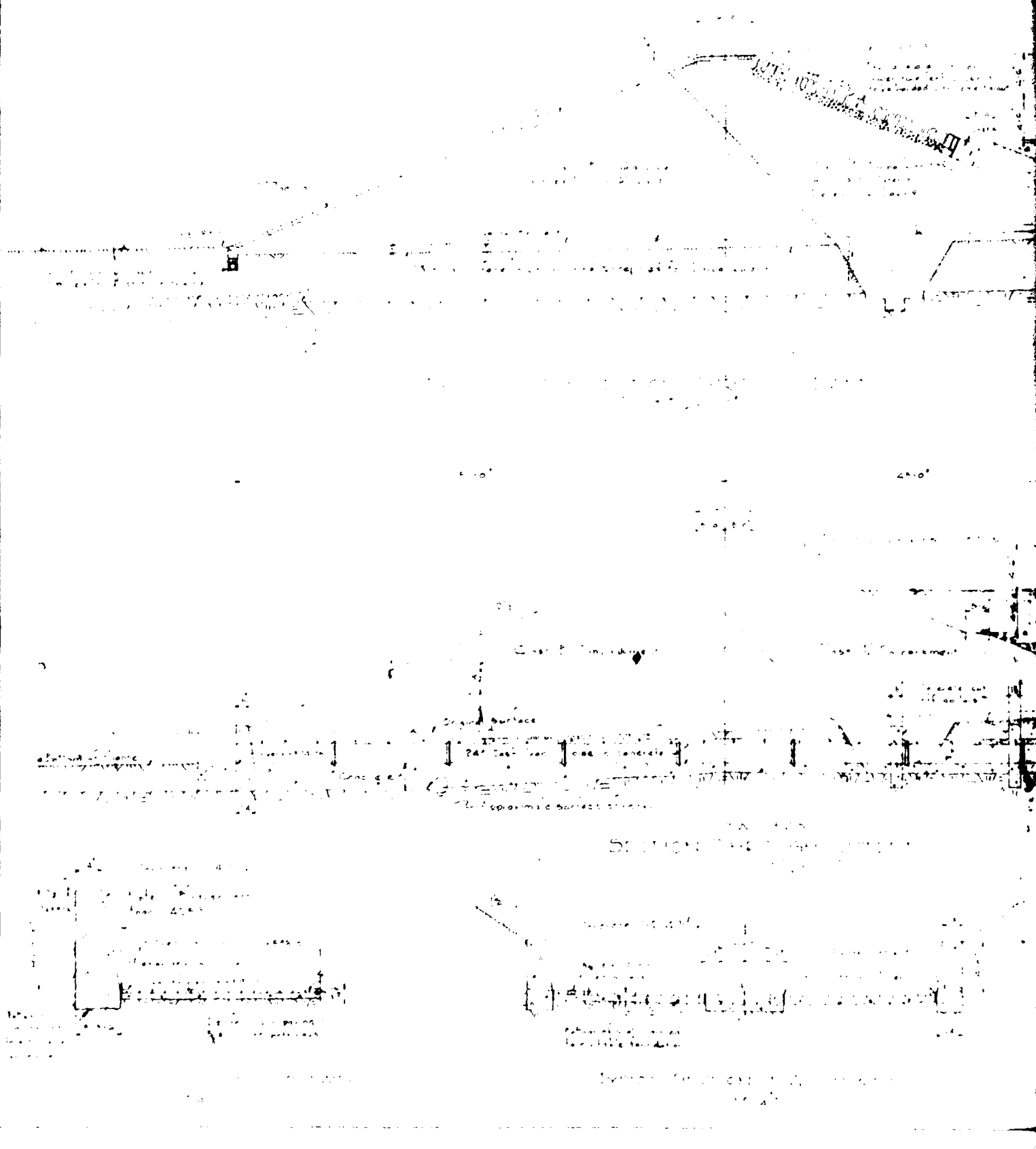
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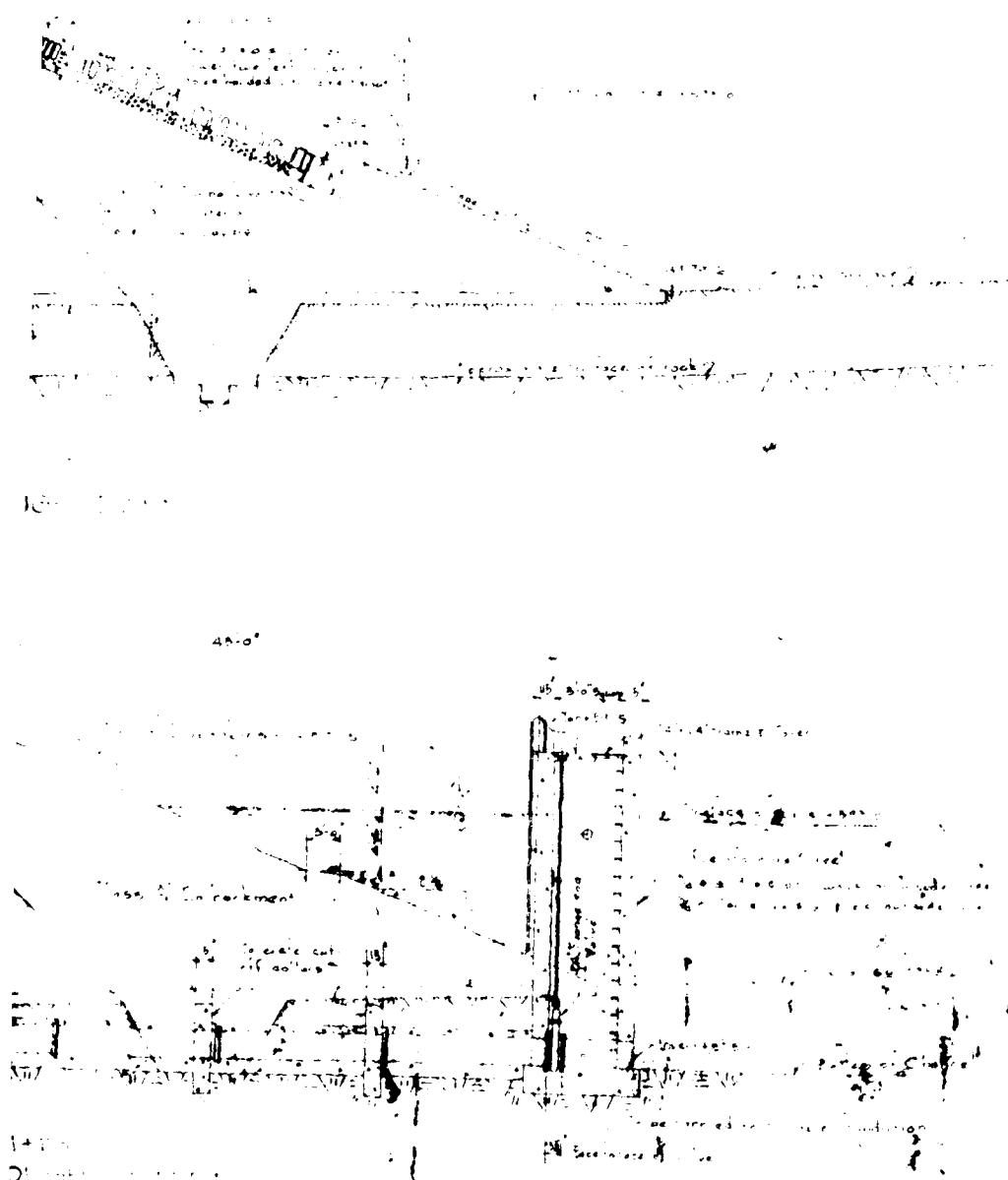


REVISED		L. H. SHEPPARD, ESQ.	
		GENERAL PLAN & LONGITUDINAL SECTION OF PROPOSED DAM	
DATE	BY	APPROVED	FOR

PA-00333
PLATE III

()



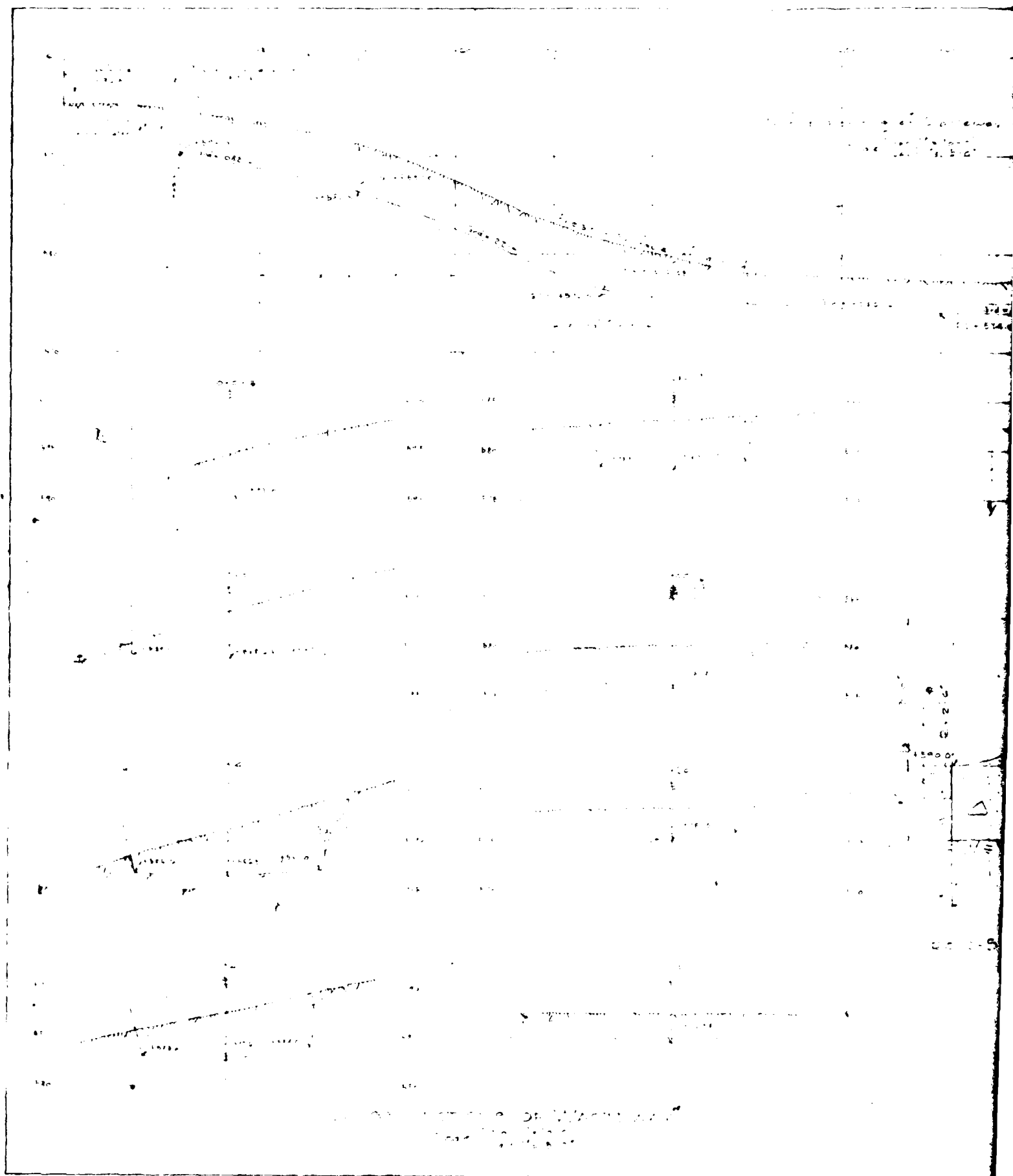


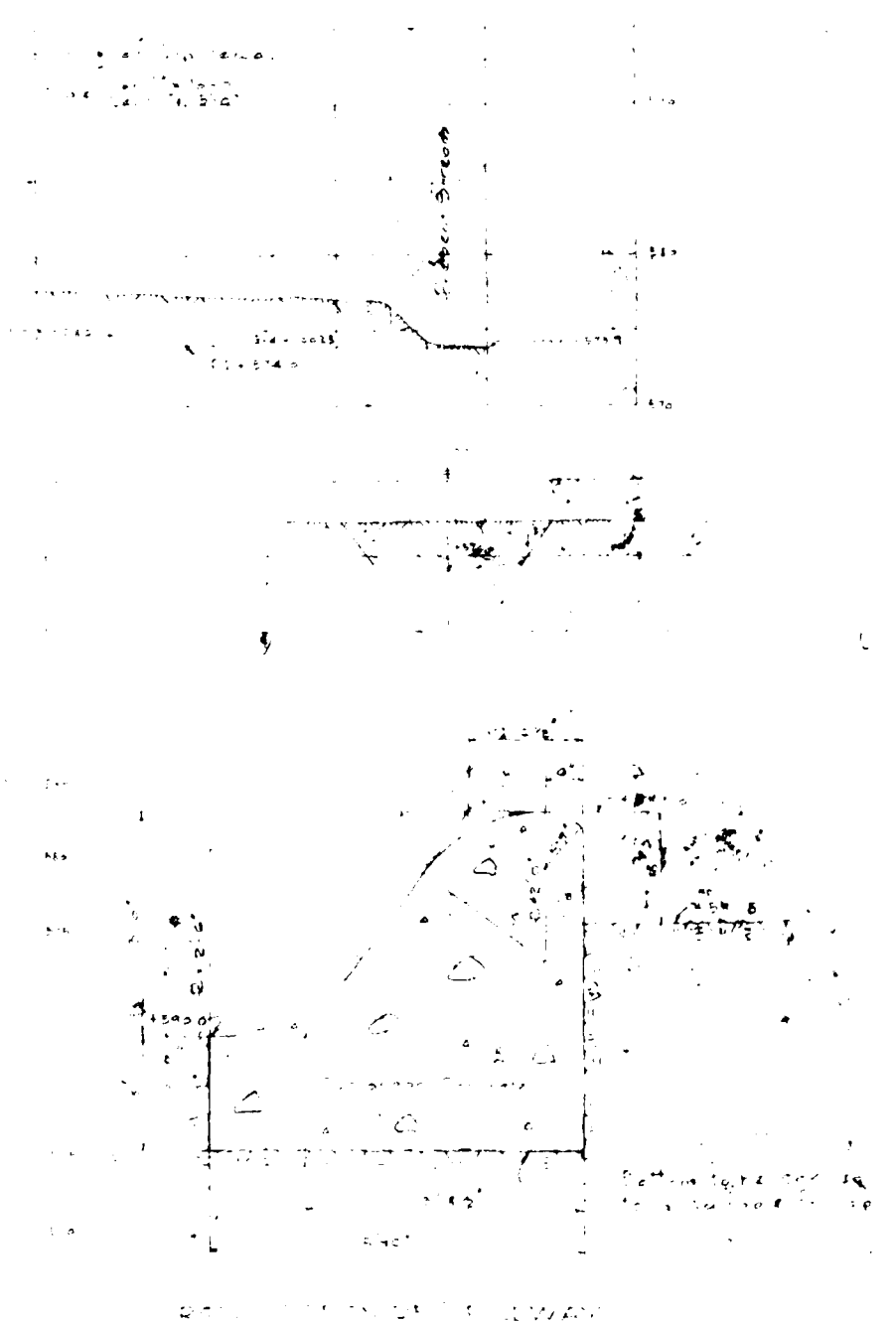
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DESIGNED BY R. H. SHEPARD, INC.					
CHECKED BY [Signature]					
CROSS SECTIONS THROUGH DAM					
Scale 1" = 20'	<table border="1"> <tr> <td>Sheet No.</td> <td>2</td> </tr> <tr> <td>Project No.</td> <td>PA-00333</td> </tr> </table>	Sheet No.	2	Project No.	PA-00333
Sheet No.	2				
Project No.	PA-00333				

PA-00333
PLATE IV





DESIGN		R. H. SHEPPARD & CO.	
PROFILE & CROSS SECTIONS OF WASTEWAY AND CROSS SECTION OF MILLWAY			
DATE	PROJECT	LOCATION	SCALE
1914
DRAWN BY		CHECKED BY	
...		...	
APPROVED BY		...	
...		...	

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PA - 00333
PLATE V

APPENDIX F
GEOLOGIC REPORT

GEOLOGIC REPORT

BEDROCK - DAM AND RESERVOIR

This area overlies the Harpers Formation which consists of dark gray, fine grained, quartzose phyllite with interlayered, dense, green, ferruginous quartzite.

STRUCTURE

This formation has close spaced, well developed joint systems which dip between 45-85°.

OVERBURDEN

The overburden in this area is most probably clay, occurring in varying thickness.

AQUIFER CHARACTERISTICS

Like all schistose formations, the Harpers has a very low magnitude secondary porosity and subsurface seepage should be of little concern.

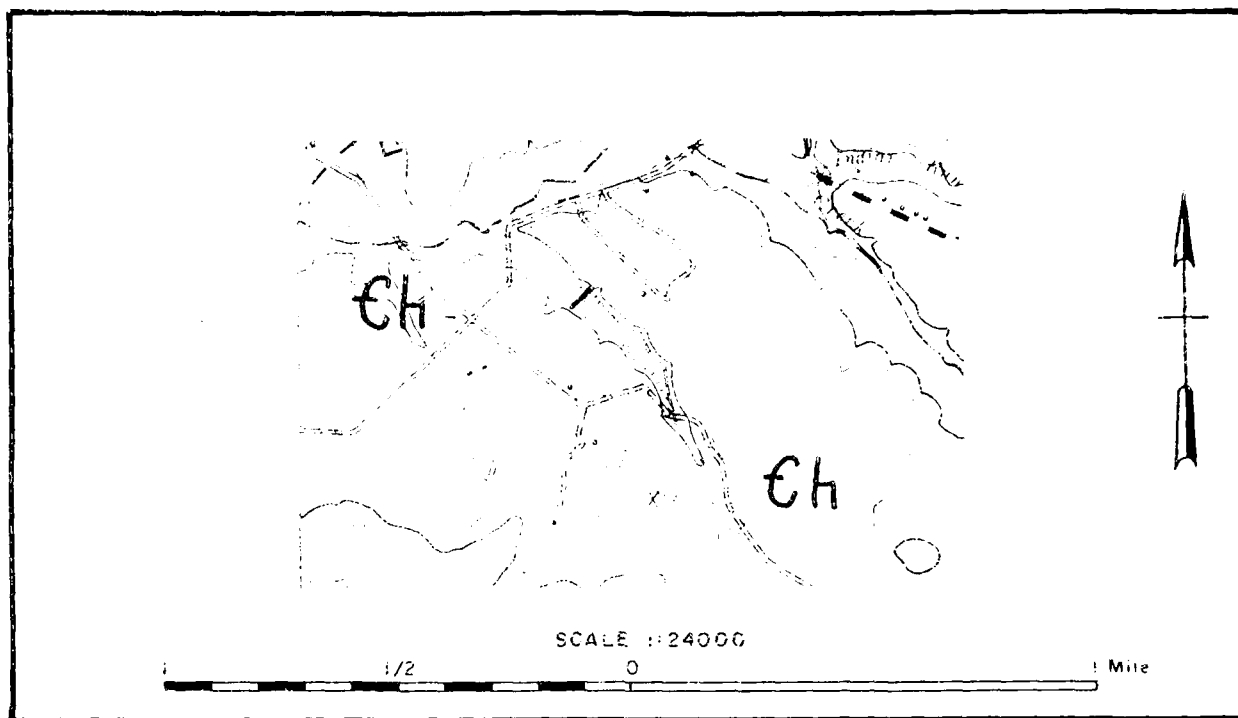
DISCUSSION

From the available construction plans, it appears that the cutoff trench of the dam was excavated to bedrock. If such is the case, the Harpers Formation provides a good quality foundation for heavy structures.

SOURCES OF INFORMATION

1. McGlade, W.G., et. al., 1972. Engineering Characteristics of the Rocks of Pennsylvania: Pennsylvania Geological Survey EG-1.
2. Stose, G.W., 1932. Geology and Mineral Resources of Adams County, Pennsylvania: Pennsylvania Geological Survey Bulletin C-1.

GEOLOGIC MAP - SHEPPARD DAM



LEGEND



Harpers Formation

END

DATE
FILMED

5-8-1

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